

IMPERIAL COUNTY AIR POLLUTION CONTROL DISTRICT



**May 20, 2016 and May 21, 2016
Exceptional Event Documentation
For the Imperial County PM₁₀ Nonattainment Area**

FINAL REPORT
December 11, 2018

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ACRONYM DESCRIPTIONS

AOD	Aerosol Optical Depth
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HC	Historical Concentrations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
INPEE	Initial Notification of a Potential Exceptional Event
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
PST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MODIS	Moderate Resolution Imaging Spectroradiometer
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration

nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM ₁₀	Particulate Matter less than 10 microns
PM _{2.5}	Particulate Matter less than 2.5 microns
PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On May 20, 2016 and May 21, 2016, State and Local Ambient Air Monitoring Stations (SLAMS), located in Imperial County California measured exceedances of the National Ambient Air Quality Standard (NAAQS). During the course of two days, the Federal Equivalent Method (FEM), Beta Attenuation Monitor Models 1020 (BAMs 1020) measured (midnight to midnight) concentrations of 24-hr average Particulate Matter less than 10 microns (PM₁₀) of 284 µg/m³, 159 µg/m³, 310 µg/m³, 370 µg/m³, 199 µg/m³, 226 µg/m³, 252 µg/m³ in Brawley, Calexico, Niland, Westmorland and El Centro (**Table 1-1**). PM₁₀ 24-hr measurements above 150 µg/m³ are exceedances of the NAAQS.

TABLE 1-1
CONCENTRATIONS OF PM₁₀ ON *MAY 22, 2016 & MAY 21, 2016

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m ³	PM ₁₀ NAAQS µg/m ³
5/20/2016	Brawley	06-025-0007	3	20	284	150
5/20/2016	Calexico	06-025-0005	3	24	159	150
5/20/2016	Niland	06-025-4004	3	24	310	150
5/20/2016	Westmorland	06-025-4003	3	23	370	150
5/21/2016	Brawley	06-025-0007	3	24	199	150
5/21/2016	Calexico	06-025-0005	3	24	226	150
5/21/2016	El Centro	06-025-1003	4	24	252	150
5/20/2016	El Centro	06-025-1003	4	20	75	150
5/21/2016	Niland	06-025-4004	3	24	114	150
5/21/2016	Westmorland	06-025-4003	3	24	94	150

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM₁₀ data from the Federal Reference Method (FRM) Size Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM₁₀ data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM₁₀ data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM₁₀ data since 2013 is regulatory. On May 20, 2016 and May 21, 2016, the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds associated with a low-pressure trough that moved through southeastern California as early as the evening of May 19, 2016.

This report demonstrates that a naturally occurring event caused an exceedance observed on May 20, 2016 and May 21, 2016, which elevated particulate matter and affected air quality. The

report provides concentration to concentration monitoring site analyses supporting a clear causal relationship between the event and the monitored exceedances and provides an analysis supporting the not reasonably controllable or preventable (nRCP) criteria. Furthermore, the report provides information that the exceedances would not have occurred without the entrainment of fugitive windblown dust from outlying deserts and mountains within the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude PM₁₀ 24-hour NAAQS exceedances of 284 µg/m³, 199 µg/m³, 159 µg/m³, 226 µg/m³, 252 µg/m³, 211 µg/m³, 370 µg/m³ (**Table 1-1**) as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER).¹

I.1 Demonstration Contents

Section II - Describes the May 20, 2016 and May 21, 2016 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the wind driven emissions from the event led to the exceedance at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors.

Section III – Using time-series graphs, summaries and historical concentration comparisons of the Brawley, Calexico, El Centro, Niland, and Westmorland stations this section discusses and establishes how the May 20, 2016 and May 21, 2016 event affected air quality such that a clear causal relationship is demonstrated between the event and the monitored exceedance. It is perhaps of some value to mention that the time-series graphs include PM₁₀ data measured in both local conditions and standard conditions. Measured PM₁₀ continuous data prior to 2013 is in local conditions, all other data is in standard conditions. The concentration difference between local and standard conditions has an insignificant impact on any data analysis. Overall, this section provides the evidence that human activity played little or no direct causal role in the May 20, 2016 and May 21, 2016 event and its resulting emissions defining the event as a “natural event”.²

Section IV - Provides evidence that the event of May 20, 2016 and May 21, 2016 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Brings together the evidence presented within this report to show that the exceptional event affected air quality; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the event and the exceedance, and that the event was a natural event.

¹ "Treatment of Data Influenced by Exceptional Events; Final Guidance", 81 FR 68216, October 2, 2016

² Title 40 Code of Federal Regulations part 50: §50.1(k) Natural event means an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.

I.2 Requirement of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD published, on May 19, 2016 (Thursday), the San Diego and Phoenix National Weather Service (NWS) office area forecast identifying a large Pacific disturbance moving into the western states. The area forecast indicated that the Pacific disturbance would bring breezy conditions as it moved through the area. As early as May 18, 2016 the San Diego NWS office identified the development of a large storm system across the west with the rebuilding of strong onshore flow. The May 18, 2016 area forecast discussion included the disclosure that winds were elevated along the San Geronio Pass and along the I-8 grade into Imperial County with gusts of 25 to 35mph. In any event, by May 19, 2016, both the San Diego and Phoenix NWS office issued the first of a series of Urgent Weather messages that contained wind advisories 1:39am and 1:17pm PST, respectively. The Urgent Weather messages identified the strongest winds along the mountains and passes of San Diego County adjacent to the desert areas. Both NWS offices forecasted southwest winds 25 to 35 mph with gusts between 40-50 mph and reduced visibility due to blowing dust. Wind advisories remained in effect until May 21, 2016. As the large system moved through the region on May 20, 2016 and May 21, 2016 the San Diego NWS office was first to issue an expiration of a wind advisory during the early morning hours of May 21, 2016. The Phoenix office did not issue an expiration of the wind advisory until the late evening hours of May 21, 2016. In response to the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day advisory for Imperial County May 19, 2016 through May 21, 2016. **Appendix A** contains copies of notices pertinent to the May 20, 2016 and May 21, 2016 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) ambient air data used for regulatory purposes. When States intend to request the exclusion of one or more exceedances of a NAAQS as an exceptional event a notification to the Administrator is required. The notification is accomplished by flagging the data in AQS and providing an initial event description.

On October 3, 2016, the US EPA promulgated revisions to the Exceptional Events rule, which included the requirement of an "Initial Notification of Potential Exceptional Event" (INPEE) process. This revised INPEE process requires communication between the US EPA regional office and the State, prior to the development of a demonstration. The intent of the INPEE process is twofold: to determine whether identified data may affect a regulatory decision and whether a State should develop/submit an EE Demonstration.

The ICAPCD made a formal written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured PM₁₀ concentrations from the Brawley, Calexico, Niland, and Westmorland monitors on April 17, 2017. The INPEE, for the May 20, 2016 and May 21, 2016 event, was formally submitted by the CARB to USEPA Region 9 on April 24, 2017. Subsequently there after a second revised request was sent to CARB requesting preliminary flags on additional days during 2016. **Table 1-1** above provides the PM₁₀ measured concentrations for all monitors in Imperial County for May 20, 2016 and May 21, 2016. A brief description of the meteorological conditions was provided to CARB, which provided preliminary information that indicated a potential natural event had occurred on May 20, 2016 and May 21, 2016.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 31, 2018. The published notice invited comments by the public regarding the request, by the ICAPCD, to exclude the May 20, 2016 and May 21, 2016 measured concentrations of 284 µg/m³ (Brawley), 159 µg/m³ (Calexico), 310 µg/m³ (Niland), 370 µg/m³ (Westmorland), 199 µg/m³ (Brawley), 226 µg/m³ (Calexico), and 252 µg/m³ (El Centro) (**Table 1-1**). The final closing date for comments was March 2, 2018. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(v)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance for 2016.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the May 20, 2016 and May 21, 2016 demonstration will have a regulatory impact upon the development and ultimate submittal of the PM₁₀ State Implementation Plan for Imperial County in 2017.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

- A This demonstration provides evidence that the event, as it occurred on May 20, 2016 and May 21, 2016, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

- a The event created the meteorological conditions that entrained emissions and caused the exceedance.
 - b The event clearly “affects air quality” such that there is the existence of a clear causal relationship between the event and the exceedance.
 - c Analysis demonstrates that the event-influenced concentrations compared to concentrations at the same monitor at other times supports the clear causal relationship.
 - d The event “is not reasonably controllable and not reasonably preventable.”
 - e The event is “caused by human activity that is unlikely to recur at a particular location or [is] a natural event.”
 - f The event is a “natural event” where human activity played little or no direct causal role.
- B This demonstration provides evidence that the exceptional event affected air quality in Imperial County by demonstrating a clear causal relationship between the event and the measured concentrations in Brawley, Calexico, El Centro, Niland, and Westmorland.
- C This demonstration provides evidence of the measured concentrations to concentrations at the same monitor at other times supporting the clear causal relationship between the event and the affected monitor.

II May 20, 2016 and May 21, 2016 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the May 20, 2016 and May 21, 2016 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (Figure 2-1). The Colorado Desert not only includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY



Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994).

A notable feature in Imperial County is the Salton Sea, which is at approximately 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2**). In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA



Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-6**). Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

The desert area, found within the western portion of Imperial County is of note because of its border with San Diego County. From west to east, San Diego County stretches from the Pacific Ocean to its boundary with Imperial County. San Diego County has a varied topography. On its western side is 70 miles (110 km) of coastline. Most of San Diego between the coast and the Laguna Mountains consists of hills, mesas, and small canyons. Snow-capped (in winter)

mountains rise to the northeast, with the Sonoran Desert to the far east. Cleveland National Forest is spread across the central portion of the county, while the Anza-Borrego Desert State Park occupies most of the northeast. The southeastern portion of San Diego County is comprised of distinctive Peninsular mountain ranges. The mountains and deserts of San Diego comprise the eastern two-thirds of San Diego County and are primarily undeveloped back county with a native plant community known as chaparral. Of the nine major mountain ranges within San Diego County, the In-Ko-Pah Mountains and the Jacumba Mountains border Mexico and Imperial County.

Both mountain ranges provide the distinctive weathered dramatic piles of residual boulders that can be seen while driving Interstate 8 from Imperial County through Devil's Canyon and In-Ko-Pah Gorge. Interstate 8 runs along the US border with Mexico from San Diego's Mission Bay to just southeast of Casa Grande Arizona.

FIGURE 2-3
JACUMBA PEAK



Fig 2-3: The Jacumba Mountains reach an elevation of 4,512 feet (1,375 m) at Jacumba Peak, near the southern end of the chain. Source: Wikipedia at https://en.wikipedia.org/wiki/Jacumba_Mountains

Northwest and northeast of the Jacumba Mountains is the Tierra Blanca Mountains, the Sawtooth Mountains and Anza-Borrego Desert State Park. Within the mountain ranges and the Anza-Borrego Desert State Park, there exists the Vallecito Mountains, the Carrizo Badlands, the Carrizo Impact Area, Coyote Mountains and the Volcanic Hills to name of few. Characteristically, these areas all have erosion that has occurred over time that extends from the Santa Rosa Mountains into northern Baja California in Mexico. For example, the Coyote Mountains consists of sand dunes left over from the ancient inland Sea of Cortez. Much of the terrain is still loose dirt, interspersed with sandstone and occasional quartz veins. The nearest community to the Coyote Mountain range is the community of Ocotillo. Of interest are the fossilized and hollowed out sand dunes that produce wind caves.

FIGURE 2-4
ANZA-BORREGO DESERT STATE PARK
CARRIZO BADLANDS



Fig 2-4: View southwest across the Carrizo Badlands from the Wind Caves in Anza-Borrego Desert State Park. Source: Wikipedia at https://en.wikipedia.org/wiki/Carrizo_Badlands

The Carrizo Badlands, which includes the Carrizo Impact Area used by the US Navy as an air-to-ground bombing range during World War II and the Korean War, lies within the Anza-Borrego Desert State Park. The Anza-Borrego Desert State Park is located within the Colorado Desert, is the largest state park in California occupying eastern San Diego County, reaching into Imperial and Riverside counties. The two communities within Anza-Borrego Desert State Park are Borrego Springs and Shelter Valley.

The Anza-Borrego Desert State Park lies in a unique geologic setting along the western margin of the Salton Trough. The area extends north from the Gulf of California to San Geronio Pass and from the eastern rim of the Peninsular Ranges eastward to the San Andreas Fault zone along the far side of the Coachella Valley. The Anza-Borrego region changed gradually over time from intermittently being fed by the Colorado River Delta to dry lakes and erosion from the surrounding mountain ranges. The area located within the southeastern and northeastern section of San Diego County is a source of entrained fugitive dust emissions that impact Imperial County when westerly winds funnel through the unique landforms causing in some cases wind tunnels that cause increases in wind speeds.

Historical observations have indicated that the desert slopes and mountains of San Diego are a source of fugitive emissions along with those deserts located to the east and west of Imperial County, which extend into Mexico (Sonoran Desert, **Figure 2-7**). Combined, the desert areas and mountains of San Diego and the desert areas that extend into Mexico are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-5
ANZA-BORREGO DESERT STATE PARK
DESERT VIEW FROM FONT'S POINT



Fig 2-5: Desert view from Font's Point. Source: Font's Point Anza-Borrego Photographed by and copyright of (c) David Corby; Wikipedia at https://en.wikipedia.org/wiki/Anza-Borrego_Desert_State_Park

FIGURE 2-6
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY



Fig 2-6: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south.

FIGURE 2-7
DESERTS IN CALIFORNIA, YUMA AND MEXICO

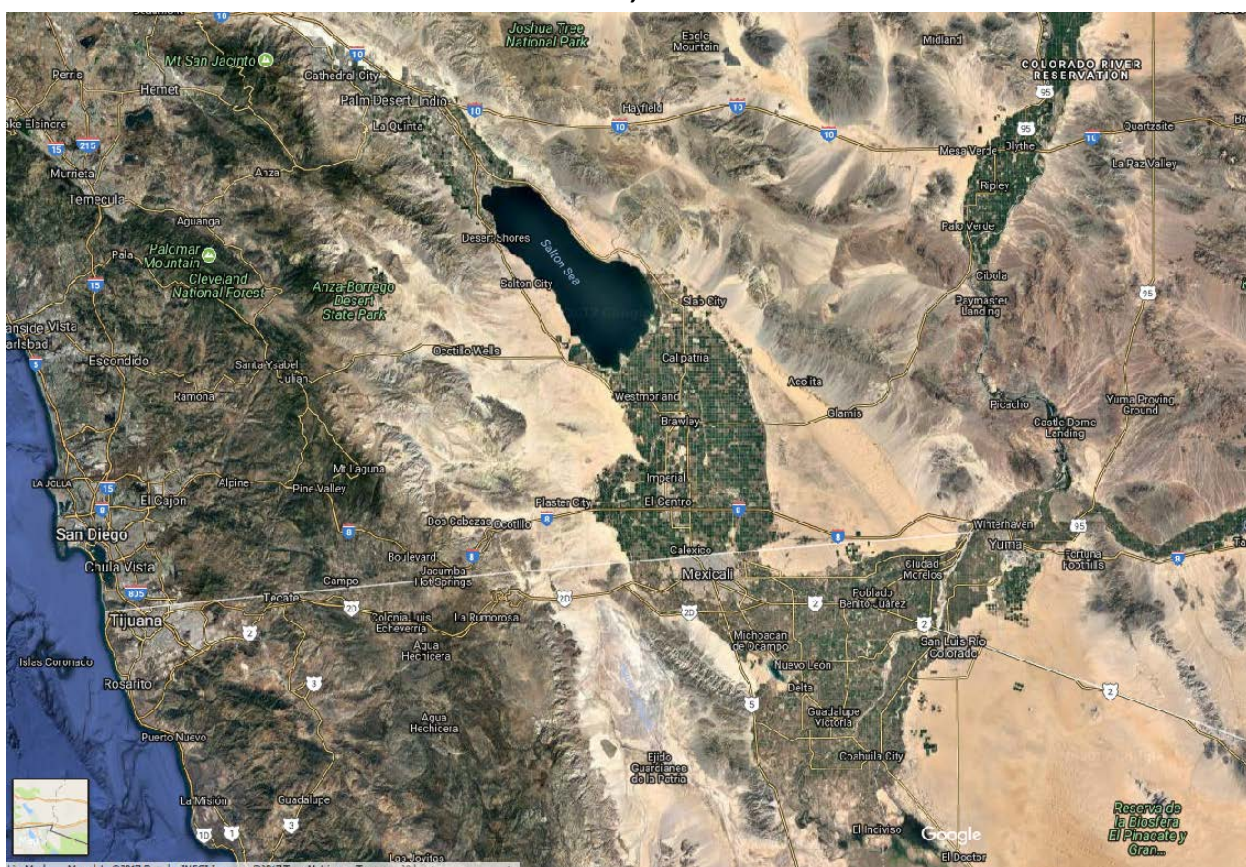


Fig 2-7: Depicts the Sonoran Desert as it extends from Mexico into Imperial County.

Source: Google Earth Terra Metrics.

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-8**. Of the five SLAMS within Imperial County four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-8 and Table 2-1**).

As mentioned above, the PM₁₀ exceedances on May 20 and May 21, 2016, occurred at the Brawley, Calexico, El Centro, Niland, and Westmorland stations. The Brawley, Niland, and Westmorland stations are regarded as the “northern” monitoring sites within the Imperial County air monitoring network. In order to properly analyze the contributions from meteorological conditions occurring on May 20 and May 21, 2016, other meteorological sites were used in this demonstration which include airports in eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), Imperial County, and other sites relevant to the wind event, such as within northern Mexico. (**Figure 2-8 and Appendix B**).

FIGURE 2-8
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

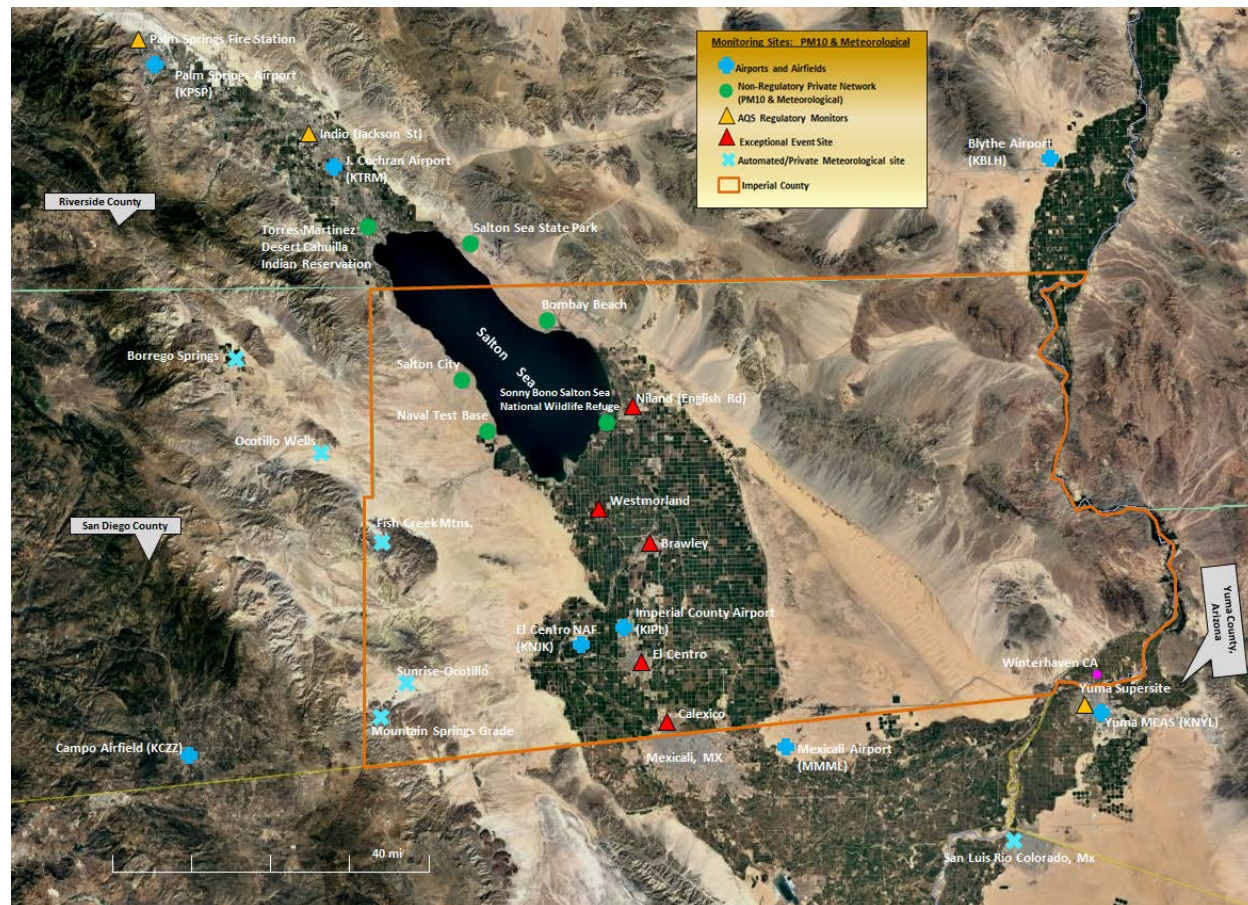


Fig 2-8: Depicts a select group of meteorological and PM₁₀ monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth

In addition to meteorological sites, there are non-regulatory PM₁₀ sites located around the Salton Sea that maybe referenced as an aid to help the reader understand the direction and velocity of winds that affect Imperial County. Unless, otherwise specifically indicated concentration references do not imply emissions from the surrounding playa of the Salton Sea. Three sites, in specific, are the Salton City air monitoring station, the Naval Test Base air monitoring station and the Sonny Bono air monitoring station. These stations are privately owned and non-regulatory (**Figures 2-9 to 2-12**). The Salton City station is located 33.27275°N latitude and 115.90062°W longitude, on the western edge of the Salton Sea (**Figure 2-9**). The station abuts a water reservoir along the Salton Sea with surrounding chaparral vegetation and unpaved open areas and roads. The Naval Test Base station is located 33.16923°N latitude and 115.85593°W longitude, on the southwestern edge of the Salton Sea (**Figure 2-11**). The station sits on an abandoned US Military site, still owned by the Department of Defense. Unlike the Salton City station, light chaparral

vegetation and sandy open dune areas surround the Naval Test Base station. Directly to the west of the station is an orchard. The Sonny Bono station is located 33.17638°N latitude and 115.62310°W longitude, on the southern portion of the Salton Sea within the Sonny Bono Salton Sea Wildlife Refuge. The Sonny Bono Salton Sea National Wildlife Refuge is 40 miles north of the Mexican border at the southern end of the Salton Sea within the Sonoran Desert. The Refuge has two separate managed units, 18 miles apart. Each unit contains wetland habitats, farm fields, and tree rows. The land of the Salton Sea Refuge is flat, except for Rock Hill, a small, inactive volcano, located near Refuge Headquarters. Bordering the Refuge is the Salton Sea on the north and farmlands on the east, south, and west.

FIGURE 2-9
SALTON CITY AIR MONITORING STATION

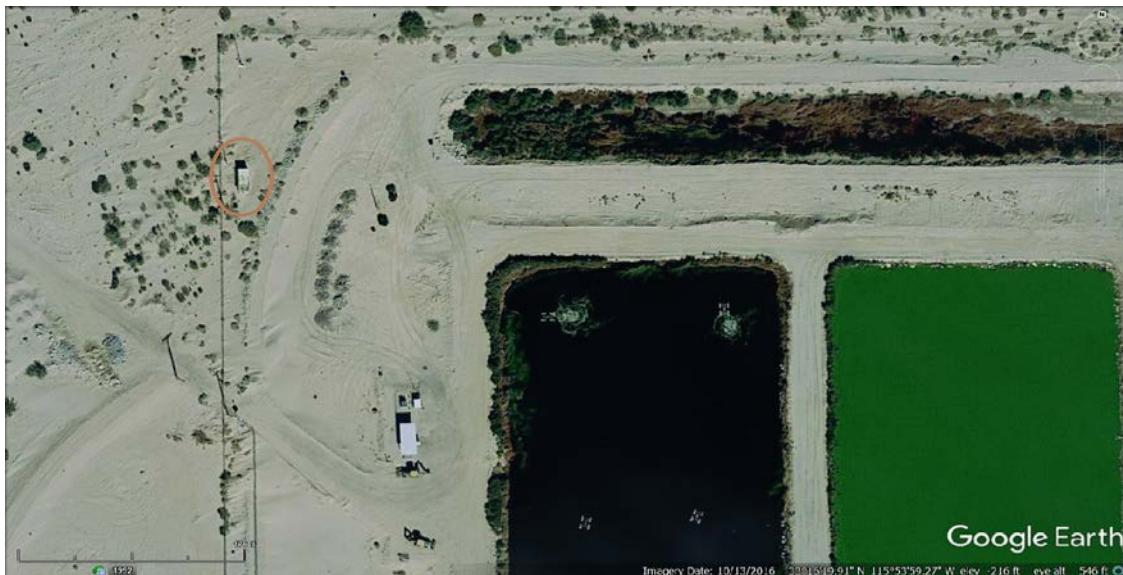


Fig 2-9: Depicts the Salton City air monitoring (circled) site operated by a private entity. Site photos available at the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-10
SALTON CITY AIR MONITORING STATION
WEST



Fig 2-10: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-11
NAVAL TEST BASE AIR MONITORING STATION



Fig 2-11: Depicts the Naval Test Base air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13603&date=17

FIGURE 2-12
NAVAL TEST BASE AIR MONITORING STATION
WEST



Fig 2-12: Photograph taken by the California Air Resources Board audit team in 2017. The photograph taken from the west facing the probe.
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-13
SONNY BONO AIR MONITORING STATION



Fig 2-13: Depicts the Sonny Bono air monitoring (circled) site operated by a private entity. To view the site photos visit the California Air Resources Board monitoring website at
https://www.arb.ca.gov/qaweb/sitephotos.php?site_no=13604&date=17

FIGURE 2-14
SONNY BONO SALTON SEA NATIONAL WILDLIFE REFUGE

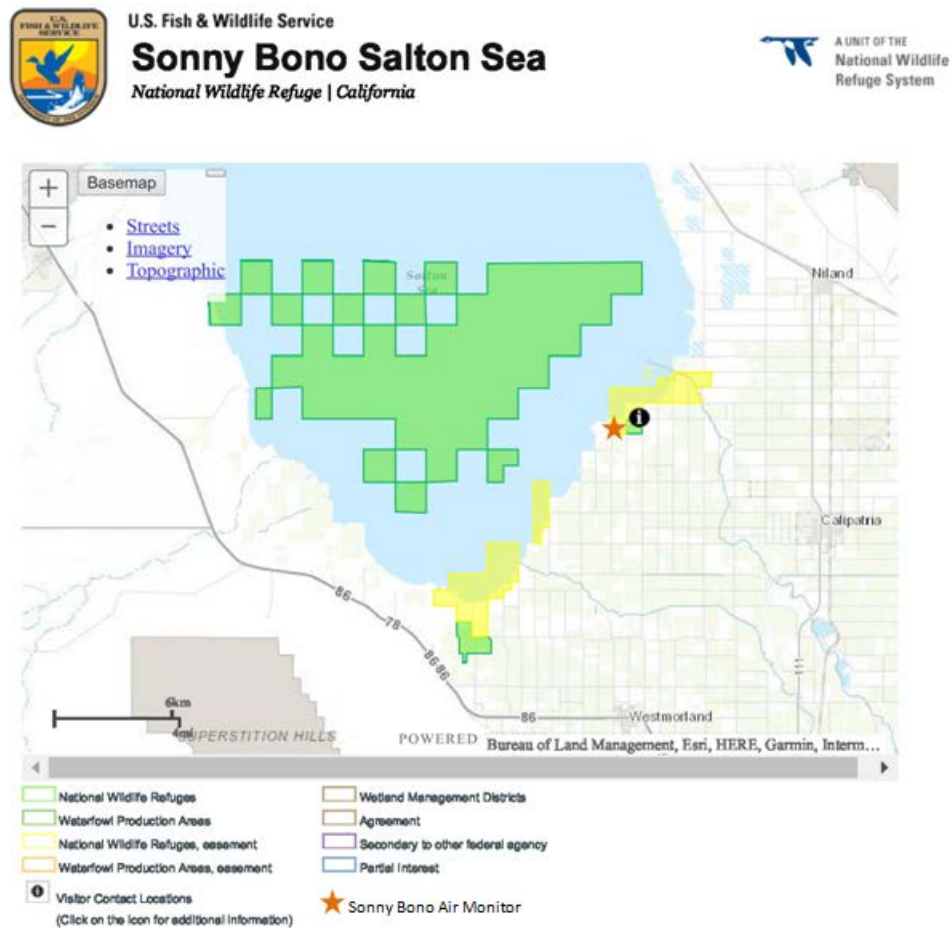


Fig 2-14: The Sonny Bono Wildlife Refuge has about 2,000 acres that are farmed and managed for wetlands. In 1998, the Refuge was renamed after Congressman Sonny Bono, who helped inform the U.S. Congress of the environmental issues facing the Salton Sea as well as acquiring funding for this Refuge to help it respond to avian disease outbreaks and other habitat challenges at the Salton Sea. Source: https://www.fws.gov/refuge/Sonny_Bono_Salton_Sea/about.html

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
MAY 20, 2016 AND MAY 21, 2016

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	24-hr PM ₁₀ (µg/m³) Avg***	1-hr PM ₁₀ (µg/m³) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY												
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	81102	13701	-15	20	-	-	-	-	-
		BAM 1020					284	995	16:00	-	-	
		Hi-Vol Gravimetric					21	-	-	-	-	-
		BAM 1020					199	653	20:00	-	-	
Calexico-Ethel Street	CARB	BAM 1020	06-025-0005	81102	13698	3	20	159	985	21:00	15	15:00
							21	226	985	00:00	16.3	15:00
El Centro-9th Street	ICAPCD	BAM 1020	06-025-1003	81102	13694	9	20	75	307	19:00	16	16:00
							21	253	995	00:00	21	2:00
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	81102	13997	-54	20	-	-	-	37	20:00
		BAM 1020					211	995	18:00	-	-	
		Hi-Vol Gravimetric					21	-	-	-	28	20:00
		BAM 1020					114	707	20:00	-	-	
Westmorland	ICAPCD	BAM 1020	06-025-4003	81102	13697	-43	20	370	995	15:00	22	18:00
							21	94	375	00:00	16	06:00
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	81102	33137	174	20	24	45	12:00	13	02:00
							21	15	0:00	20:00	12	21:00
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	81102	33157	1	20	96	717	16:00	16	16:00
							21	39	121	19:00	16	19:00
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	81102	N/A	60	20	118	748	19:00	-	-
							21	130	364	00:00	-	-

*CARB = California Air Resources Board

*ICAPCD = Air Pollution Control District, Imperial County

*SCAQMD = South Coast Air Management Quality District

*ADEQ = Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question in Pacific Standard Time (PST) unless otherwise noted

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-15**) encompassing approximately 7 million acres (28,000 km²). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-15
SONORAN DESERT REGION

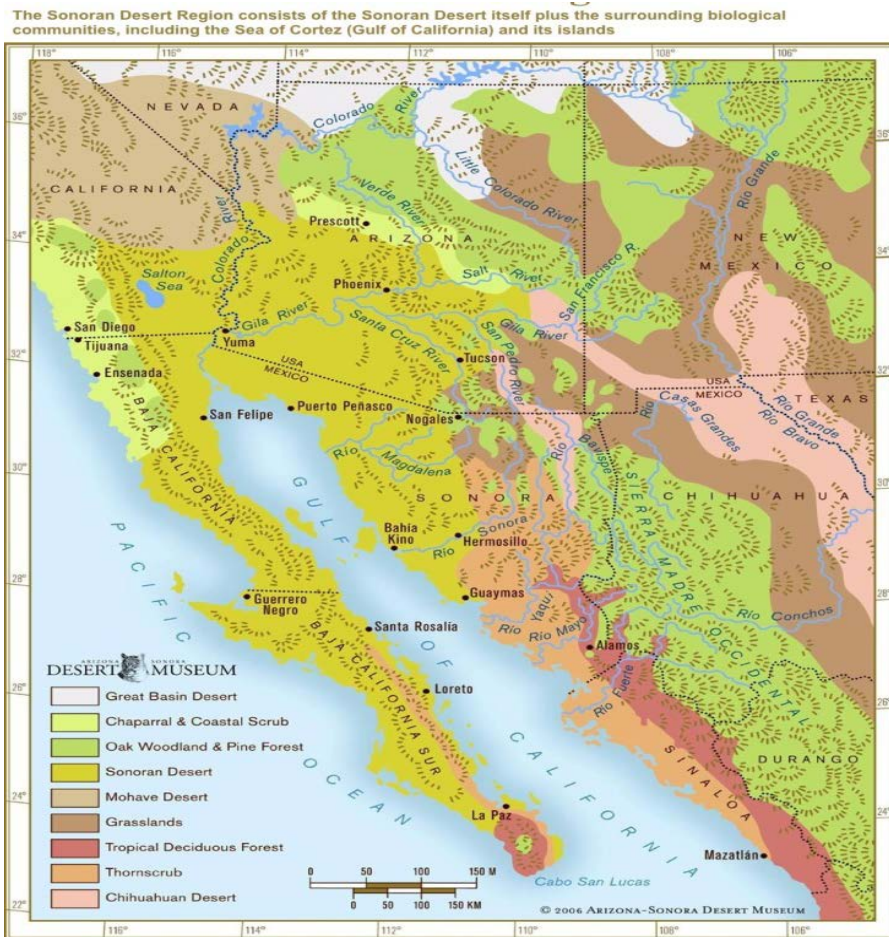


Fig 2-15: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at <http://desertmuseum.org/center/map.php>

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and

late summer), especially toward the southern portion of the region which includes a portion of San Diego County. The Colorado Desert portion of San Diego County receives the least amount of precipitation. Borrego Springs, the largest population center within the San Diego desert region averages 5 inches of rain with a high evaporation rate. By contrast, the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region is demonstrated when historic annual average precipitation levels in Imperial County average 2.64" (**Figure 2-16**). During the 12 month period prior to the May 20, 2016 and May 21, 2016 event, Imperial County measured a total annual precipitation of 1.16 inches. Such arid conditions, as those preceding the event, result in soils that are particularly susceptible to particulate suspension by the elevated gusty winds.

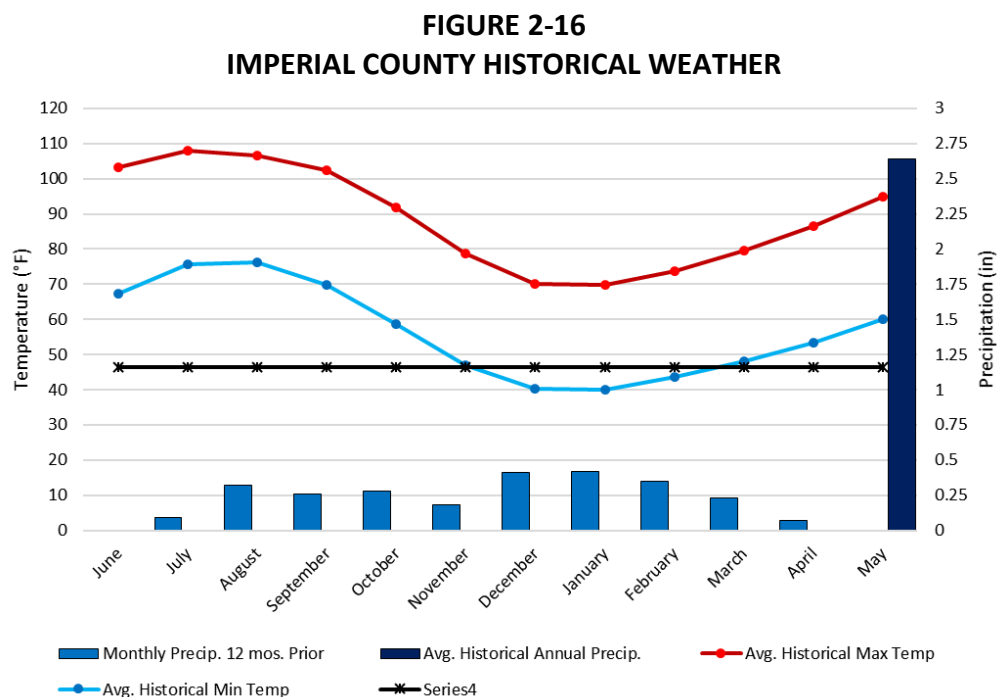


Fig 2-16: Historical Imperial County weather. Prior to May 20, 2016 and May 21, 2016, the region suffered abnormally low total precipitation of 1.16 inches. Average annual precipitation is 2.64 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground <http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713>

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the

pressure gradient increases so does the speed of the wind.³ Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns may recur seasonally.

Typically high pressure brings clear skies and with no clouds there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for May 20, 2016 and May 21, 2016, which was caused by a large Pacific low-pressure system that developed across the Pacific Northwest, weakening the ridge aloft and increasing the onshore flow. As the low-pressure trough deepened and moved into California, strong winds developed within the mountains and deserts of San Diego County as early as May 19, 2016 in response to a tightening onshore pressure gradient. On May 20, 2016 and May 21, 2016 gusty westerly winds swept across southeastern California as the Pacific low-pressure moved into the western states, affecting air quality and causing exceedance in Brawley, Calexico, El Centro, Niland and Westmorland.

Figures 2-17 through 2-19 provide information regarding the expected movement of the upper level low and the strengthening of the surface gradient that resulted in powerful gusty winds across Imperial County.

³ NWS JetStream – Origin of Wind <http://www.srh.noaa.gov/jetstream/synoptic/wind.html>

FIGURE 2-17
UPPER LEVEL TROUGH MOVES OVER REGION

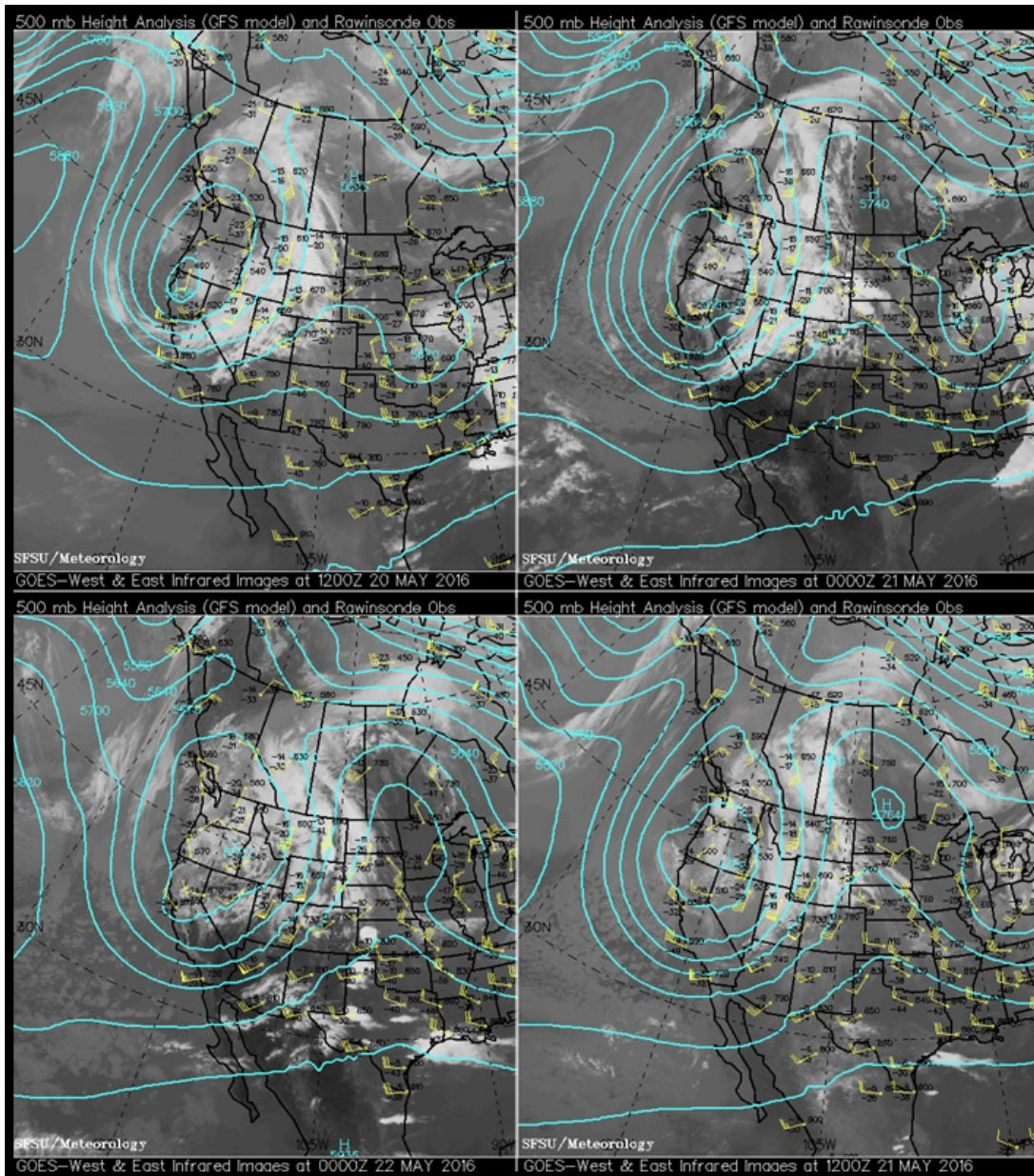


Fig 2-17: A quad of infrared 500mb height maps showing the upper level low as the system moved eastward. The upper level trough moving through the region strengthened the gradient at the surface and led to conditions conducive to high winds. Clockwise, from top left: 0400; 1600 PST May 20, 2016; 0400; 1600 PST May 21, 2016. Source: SFSU Department of Earth & Climate Sciences; http://virga.sfsu.edu/archive/composites/sathts_500/1605

FIGURE 2-18
SURFACE GRADIENT TIGHTENS MAY 20, 2016

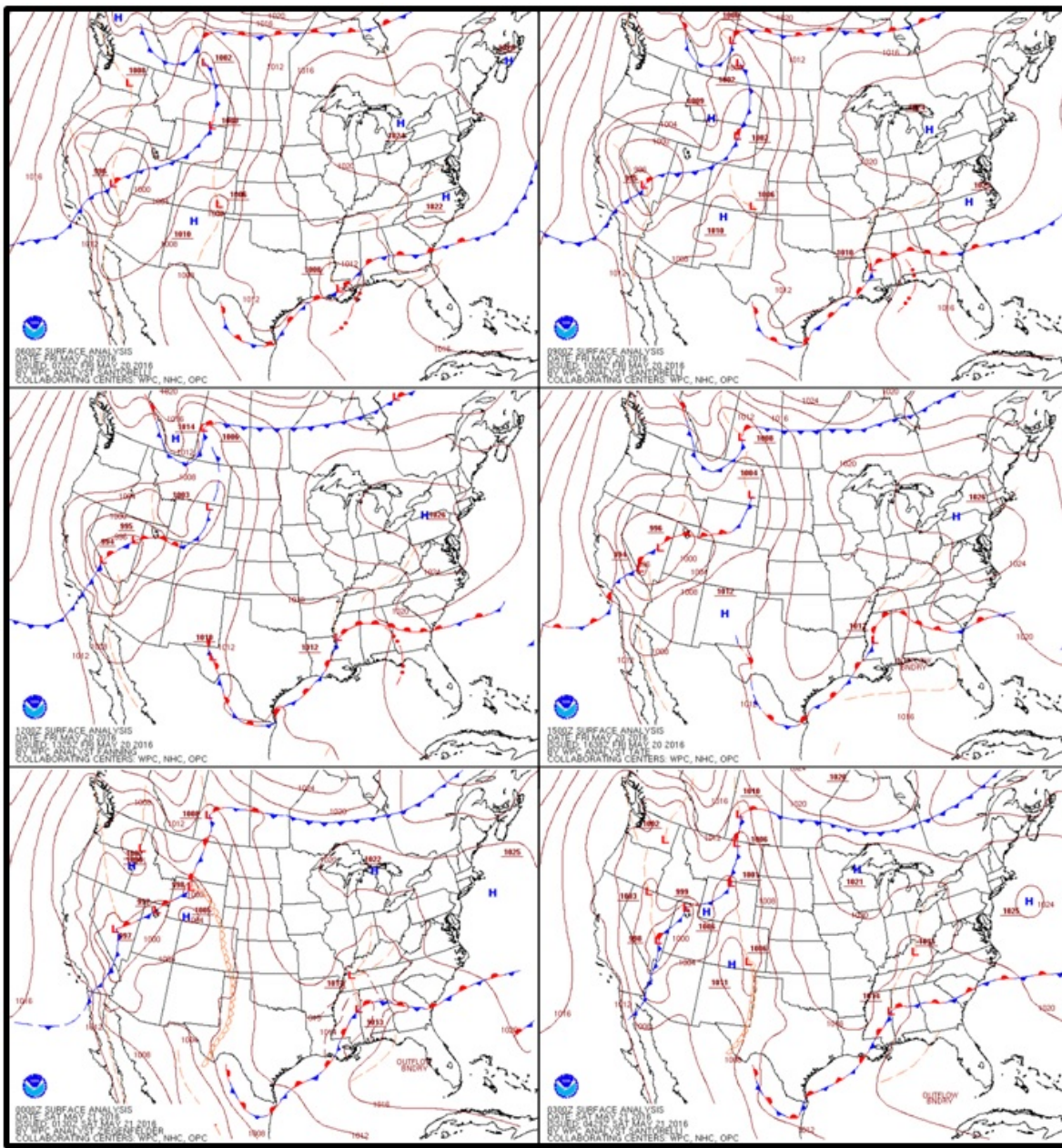


Fig 2-18: Surface analysis maps show the tightening of the gradient over southern California. By 2200 PST on May 19 the gradient was already tightening (top left). By 0100 PST on May 20 (top right) the gradient had become more packed. The tightening of the gradient created strong winds across southeast California and western Arizona. Top left: 2200 May 19, 2016; top right 0100 May 20, 2016; middle left 0400; middle right 0700; bottom left 1600; bottom right 1900. Source: NWS Weather Prediction Center Surface Analysis Archive

FIGURE 2-19
SURFACE GRADIENT REMAINS PACKED MAY 21, 2016

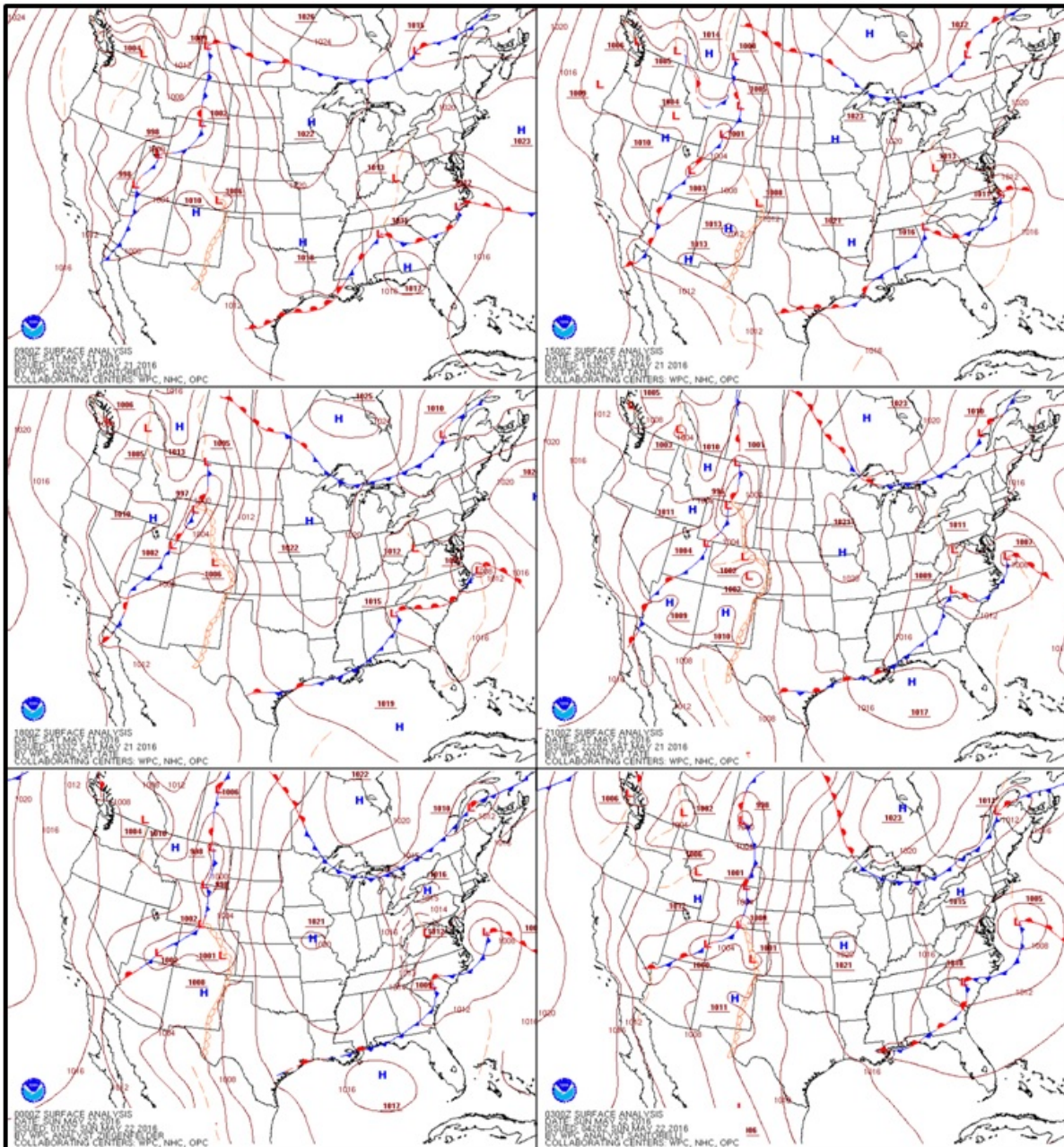


Fig 2-19: Six images of surface analysis maps showing the pressure gradient for May 21, 2016. Between 0100 and 0700 PST the gradient relaxed a bit (top left and right). El Centro NAF reported strong winds and gusts through about 0600, when winds and gusts dropped marginally before increasing again around noon. This corresponds to 1300 (middle right) when the gradient began to tighten again. It remained moderately packed through 1900 May 21, 2016 coincident with moderate winds. Source: NWS Weather Prediction Center Surface Analysis Archive.

The intensity of the Pacific weather system as it moved over the western states prompted the San Diego NWS office to issue its first of seven separate Urgent Weather messages containing wind advisories as early as May 19, 2016 at 139am PST. By the afternoon of May 19, 2016, the Phoenix NWS office issued its first of ten separate Urgent Weather messages containing wind advisories. The wind advisories for both NWS offices forecasted wind speeds between 20 to 30 mph, gusts between 40 to 50 mph with isolated 60 mph gusts and advised of reduced visibility due to blowing dust. San Diego wind advisories expired May 21, 2016 at 2:00am PST while the Phoenix wind advisories expired at 9:00pm PST on May 21, 2016.

Both NWS offices, San Diego and Phoenix, issued separate Public Information Statements containing wind reports. The first Public Information Statement issued by the San Diego NWS office identified wind speeds for Ocotillo Wells (May 19, 2016) and Borrego Springs (May 20, 2016) of 38 mph and 35 mph, respectively. Mount Laguna had the highest measured wind speed for May 20, 2016 at 61 mph while Harrison Peak measured 41 mph for the same day. The second issued Public Information Statement by the San Diego NWS identified Borrego Springs, In Ko Pah and Ocotillo Wells with associated wind speeds of 45 mph, 37 mph and 43 mph. Mount Laguna measured higher winds speeds at 64 mph while Harrison Peak and Boulevard measured 41 mph and 39 mph, respectively.

The first Public Information Statement issued by the Phoenix NWS office identified top wind speeds for Imperial County off Sunrise highway (May 21, 2016) at 57 mph second only to the Mountain Springs Grade (May 20, 2016) at 55 mph. The Naval Air Facility (May 20, 2016) and the Imperial County Airport (May 21, 2016) took third and fourth with 52 mph and 46 mph. Glamis (May 20, 2016) measured the lowest wind speeds at 25 mph. The second and third Public Information Statements issued by the Phoenix NWS office identified wind speeds for afternoon and evening hours on May 21, 2016. Mountain Springs Grade measured the highest wind speed at 50 mph while the Imperial County Airport measured the lowest wind speed at 33 mph. **Appendix A** contains copies of all Public Information Statements.

Figures 2-20 and 2-21 are graphical illustrations of the chain of events for May 20, 2016 and May 21, 2016. Elevated winds began as early as the evening of May 19, 2016 continuing through May 21, 2016. Winds diminished slightly during the early morning hours of May 20, 2016 only to elevate in speed and gust by noon. Elevated wind speeds and gust continued through the evening and early morning hours of May 21, 2016. By mid-day May 22, 2016 winds diminished substantially. All northern monitors measured elevated peak concentrations during the late afternoon hours while the more southern stations did not measure elevated concentrations until late evening. Ultimately, the Brawley, Calexico, Niland, and Westmorland monitors measured exceedances on May 20, 2016.

FIGURE 2-20
RAMP-UP ANALYSIS MAY 20, 2016

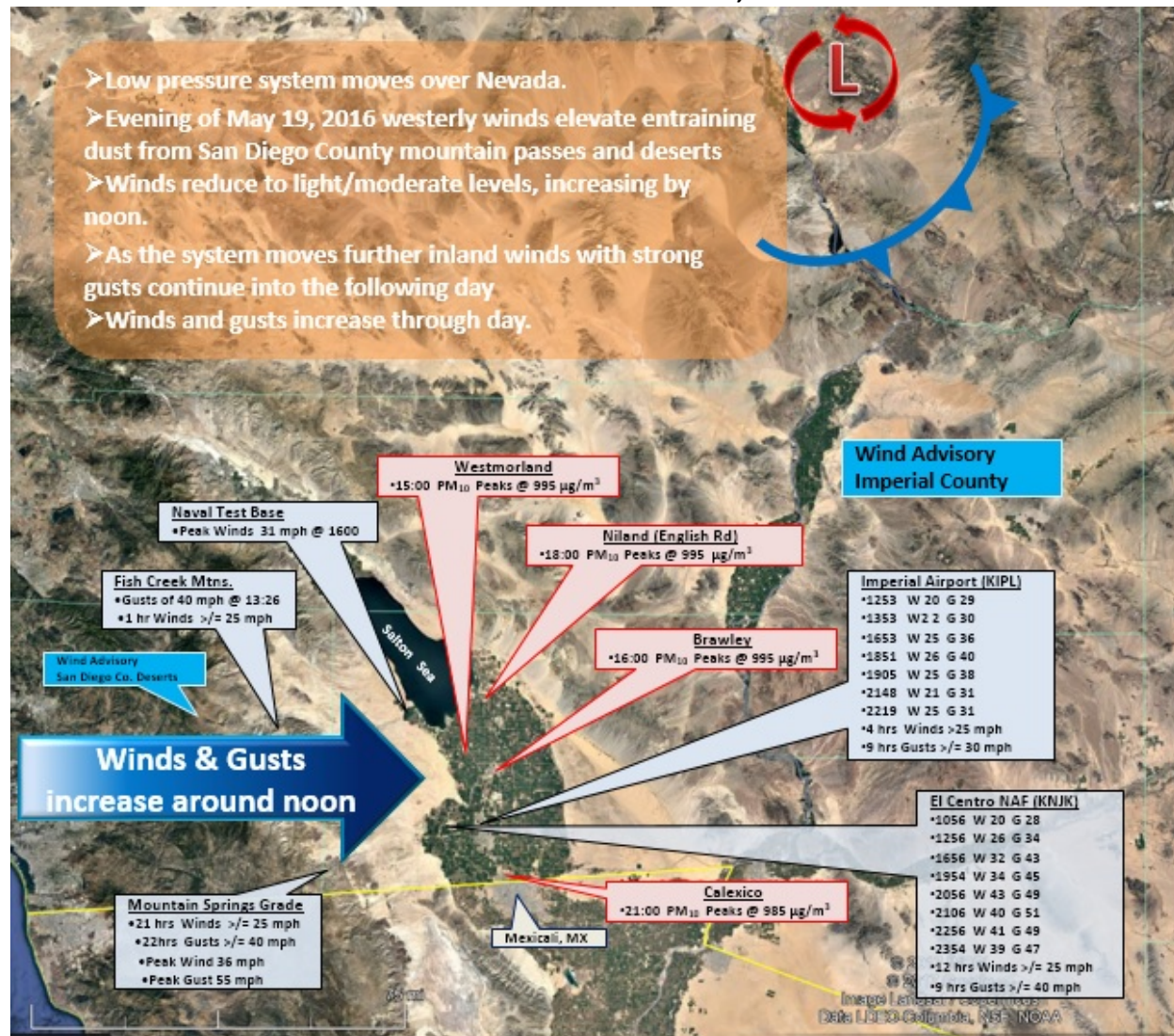


Fig 2-20: Elevated winds occurred as early as May 19, 2016 within the San Diego mountains and passes. During the early morning hours of May 20, 2016, winds elevated by noon and continued to increase throughout the day. Brawley, Calexico, Niland, and Westmorland all measured exceedances. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map

The strong gusty winds on May 20, 2016 carried over into May 21, 2016. Suspended dust particles provided the ideal condition for peak hourly PM₁₀ concentrations at Calexico and Brawley at 0000 hours. Brawley reached peak hourly concentrations at 20:00, shortly before winds diminished to a moderate level.

FIGURE 2-21
RAMP-UP ANALYSIS MAY 21, 2016

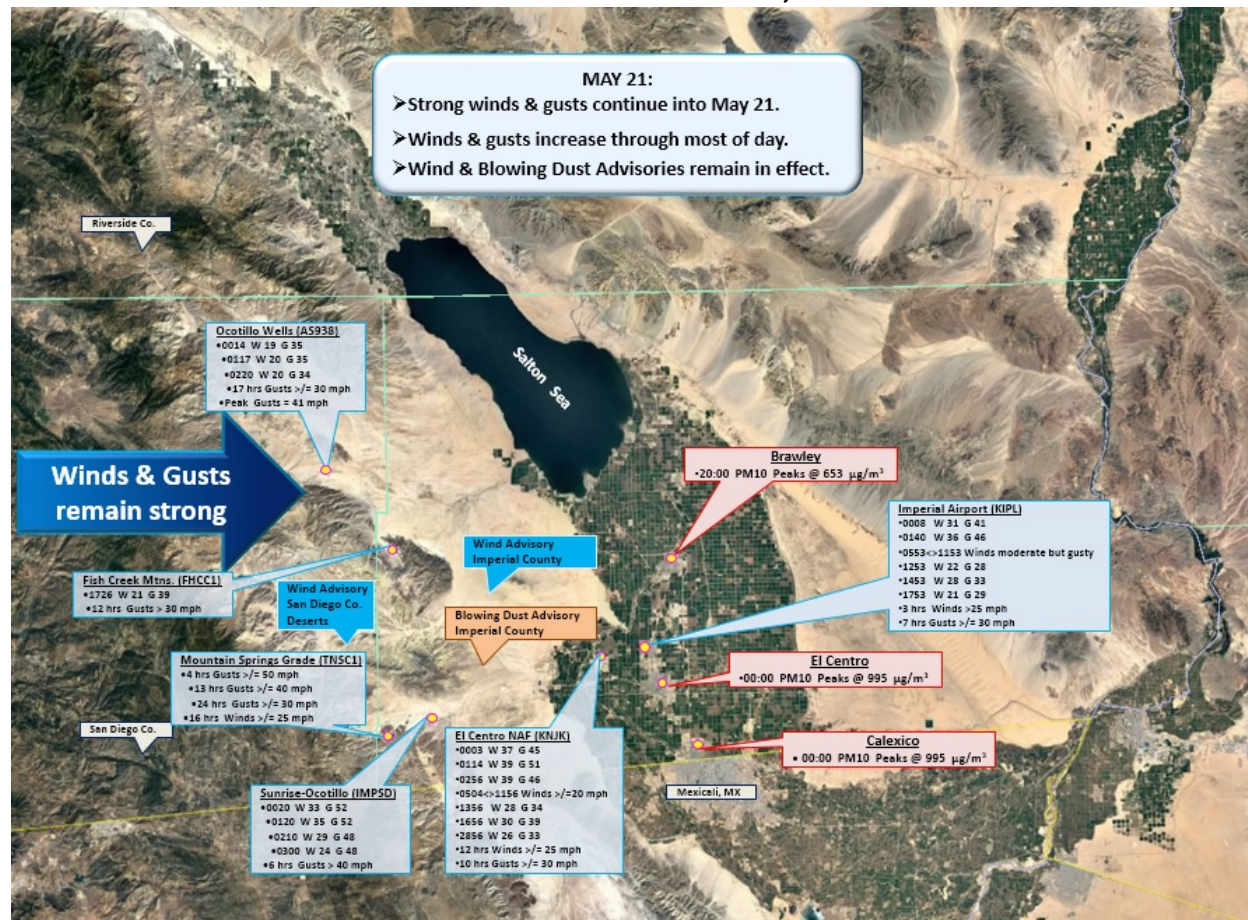


Fig 2-21: The strong winds and gusts on May 20, 2016 carried over into May 21, 2016. Air quality data from the EPA's AQS databank. Wind data from the NCEI's QCLCD system. Google Earth base map.

Table 2-2 contains a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON MAY 20 AND MAY 21, 2016

Station Monitor Airport Meteorological Data	Day	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM ₁₀ correlated to time of Max Wind Speed				
		Brly	CX	EC	Nlnd	Wstmd					
IMPERIAL COUNTY											
Imperial Airport (KIPL)	20	26	280	18:51	40	18:51	-	71	177	995	995
	21	36	280	1:40	46	1:40	569	985	995	62	238
Naval Air Facility (KNJK)	20	43	270	20:56	51	21:06	-	785	-	666	995
	21	39	270	1:14	51	1:14	569	985	995	62	238
Calexico (Ethel St)	20	15	307	15:00	-	-	564	126	123	744	995
	21	16.3	299	15:00	-	-	75	248	117	42	111
El Centro (9th Street)	20	16.3	286	21:00	-	-	-	785	-	995	995
	21	20.7	286	2:00	-	-	546	985	660	40	137
Niland (English Rd)	20	36.7	268	20:00	-	-	-	785	-	666	995
	21	27.6	256	20:00	-	-	653	66	150	707	59
Westmorland	20	22.1	278	18:00	-	-	-	177	177	995	995
	21	16.1	283	6:00	-	-	119	61	55	19	49
RIVERSIDE COUNTY											
Blythe Airport (KBLH)	20	21	200	10:52	37	10:52	55	28	41	46	140
	21	23	210	16:52	28	11:52	138	158	164	87	95
Palm Springs Airport (KPSP)	20	25	340	10:53	39	11:53	55	28	41	46	140
	21	21	340	14:53	25	16:53	25	122	123	54	56
Jacqueline Cochran Regional Airport (KTRM) - Thermal	20	24	350	18:52	33	18:52	-	71	177	995	995
	21	25	330	19:52	33	19:52	352	80	119	363	120
ARIZONA - YUMA											
Yuma MCAS (KNYL)*MST	20	21	220	12:57	28	12:57	84	27	27	216	290
	21	17	320	1:57	32	1:57	569	985	995	62	238
MEXICALI - MEXICO											
Mexicali Int. Airport (MXL)	20	21.9	310	23:08	-	-	-	320	-	76	-
	21	21.9	310	17:50	-	-	232	116	83	179	90

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

The National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,⁴ depicted in **Figures 2-22 and 2-23**, illustrates the general path of the air parcel in the hours leading up to peak concentrations at Brawley, Calexico, Niland, and Westmorland. The left image in **Figure 2-22** depicts a six-hour back-trajectory ending at 1600 PST at Brawley, Niland, and Westmorland when monitors either measured peak hourly concentrations just before a measured peak hourly concentration. The right image depicts a six-

⁴ The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's [MODIS](#) satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind. The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

hour back-trajectory ending at Calexico and El Centro at 2100 PST, during the hour when Calexico measured its highest 24-hour concentration. El Centro, which did not measure an exceedance, measured its highest hourly concentration at 1900, just before a power failure at the station. In all probability the El Centro monitor would have measured an exceedance but for the power failure.

Figure 2-23 combines the HYSPLIT trajectories against a base map. It should be noted that modeled winds can differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km and is integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions.

FIGURE 2-22
HYSPLIT MODELS MAY 20, 2016

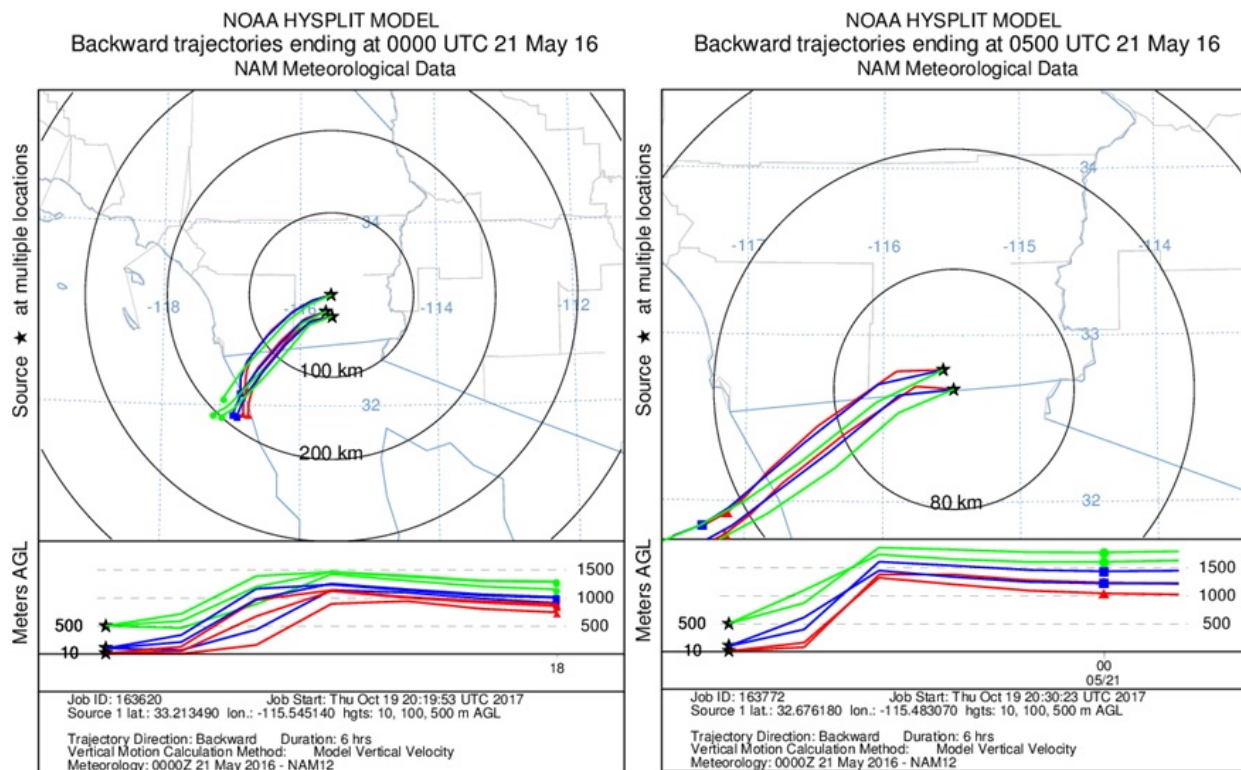


Fig 2-22: Left image is a 6-hour back trajectory ending at 1600 PST at Brawley, Niland, and Westmorland. Right image is a 6-hour back trajectory ending at 2100 at Calexico and El Centro. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model

FIGURE 2-23
HYSPLIT MODELS WITH BASE MAP MAY 20, 2016

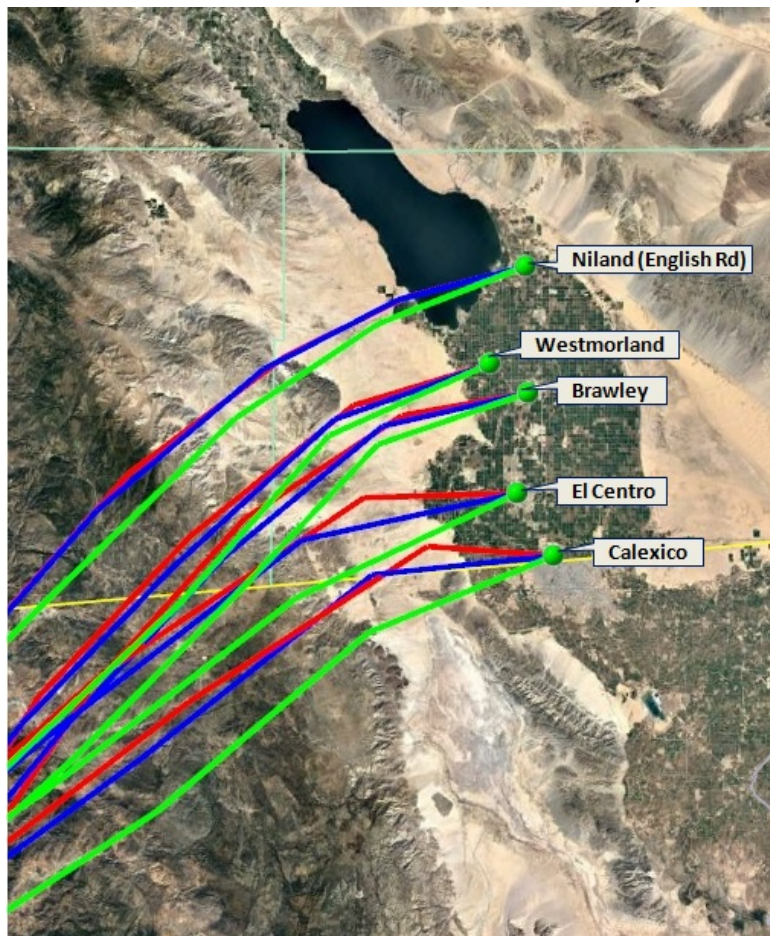


Fig 2-23: A 6-hour back trajectory ending at 1600 PST at Brawley, Niland, and Westmorland, and at 2100 PST at Calexico and El Centro. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates air flow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figure 2-24 depicts HYSPLIT back-trajectories ending at Calexico and El Centro at 0000 PST on May 21, 2016 (left image), during the hour in which both monitors measured peak hourly concentrations. Similarly, the right image depicts a 20-hour back-trajectory ending at Brawley's measured peak concentration 2000 PST. Regardless of an exceedance all monitors are included in the trajectory. **Figure 2-25** combines the trajectories against a base map. **Figures 2-23 and 2-25** illustrate the westerly airflow over the San Diego Mountain and passes and into Imperial County.

FIGURE 2-24
HYSPLIT MODELS – MAY 20, 2016

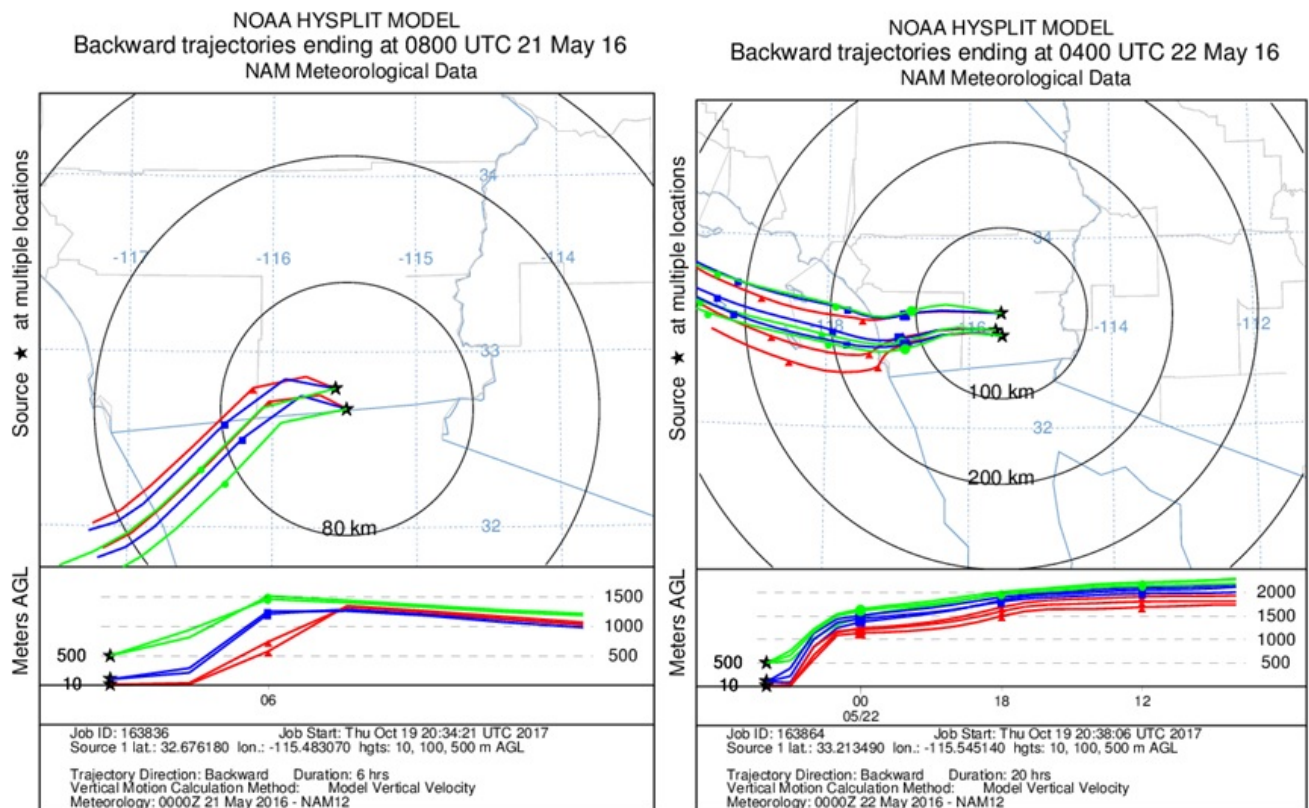


Fig. 2-24: Left image is a 6-hour back trajectory ending at 0000 at Calexico and El Centro. Right image is a 20-hour back trajectory ending at 2000 PST at Brawley, Niland, and Westmorland. Red trajectory indicates air flow at 10 meters AGL (above ground level); blue indicates air flow at 100m; green indicates air flow at 500m. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model.

FIGURE 2-25
HYSPLIT MODELS WITH BASE MAP – MAY 21, 2016

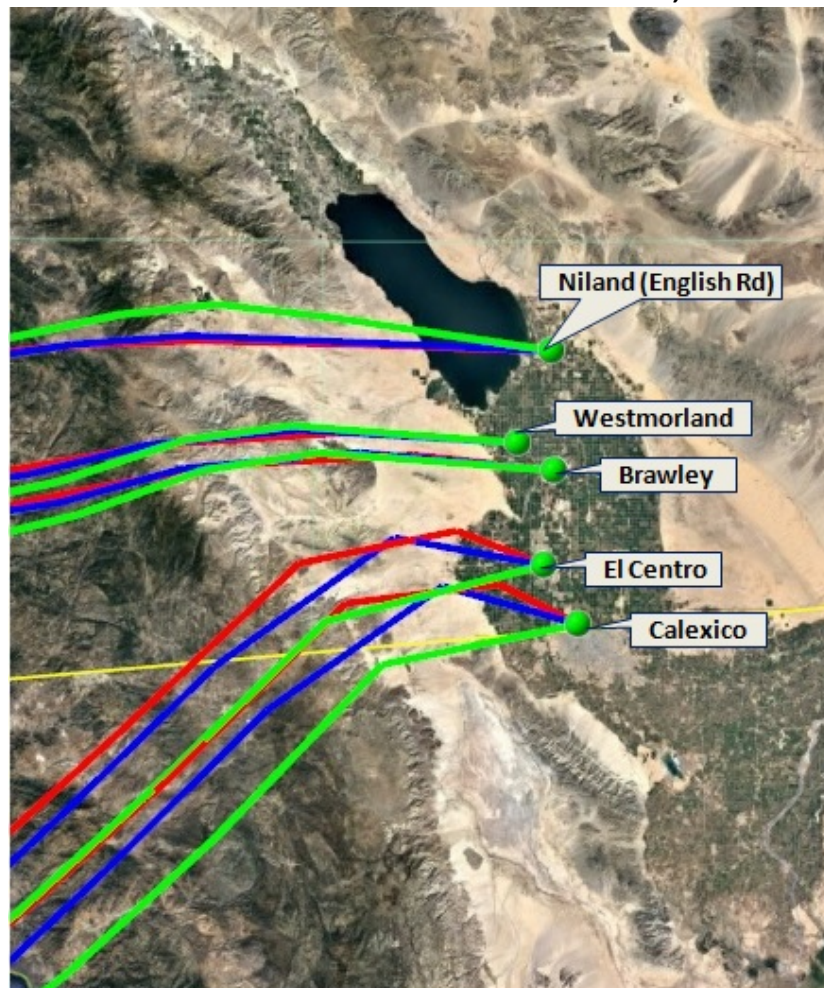


Fig 2-25: A 20-hour back trajectory ending at 2000 PST AT Brawley, Niland, and Westmorland, and at 0000 PST AT Calexico and El Centro on May 21, 2016. Red trajectory indicates airflow at 10 meters AGL (above ground level); blue indicates airflow at 100m; green indicates airflow at 500m. Yellow line indicates the international border. Aqua lines denote county boundaries. Dynamically generated through NOAA's Air Resources Laboratory HYSPLIT model. Base map from Google Earth

Figures 2-26 and 2-27 illustrate the elevated levels of hourly PM_{10} concentrations measured in Riverside, Imperial and Yuma Counties for a total of four days, May 19, 2016 through May 22, 2016. Elevated emissions were entrained into Imperial County affecting the Brawley, Calexico, El Centro, Niland, and Westmorland monitors when gusty west winds that were associated with the passage of a low pressure system that moved across southern California and into Imperial County as early as the evening of May 19, 2016 through May 21, 2016. The Brawley, Calexico, El Centro, Niland, and Westmorland monitors measured the highest elevated concentrations by mid-afternoon on May 20, 2016 remaining elevated through the morning of May 21, 2016. This is coincident with measured wind speeds and gusts above 25mph.

The resulting entrained dust and accompanying high winds from the system qualify this event as a “high wind dust event”.⁵ High wind dust events are considered natural events where the windblown dust is either from solely a natural source or from areas where anthropogenic sources of windblown dust are controlled with Best Available Control Measures (BACM). The following sections provide evidence that the May 20, 2016 and May 21, 2016 high wind event qualifies as a natural event and that BACM was overwhelmed by the suddenness and intensity of the meteorological event.

FIGURE 2-26
96-HOUR WIND SPEEDS AT VARIOUS SITES

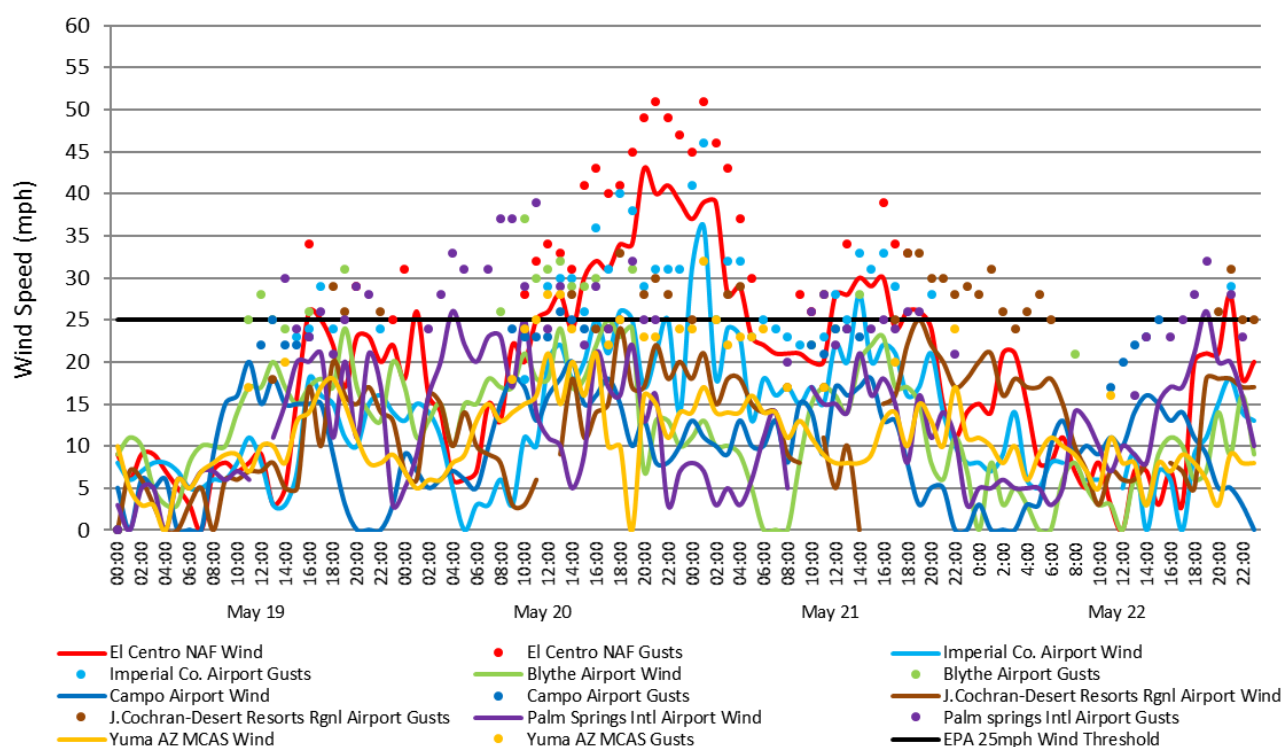


Fig 2-26: Is the graphical representation of the 96 hour measured winds speeds and gusts at various sites including regional airfields in California and Arizona. The graph illustrates the significant number of hours where measured wind speeds and wind gusts were above 25 mph. The graph supports the regional nature of the event. Wind Data from the NCEI’s QCLCD system

⁵ Title 40 Code of Federal Regulations part 50: §50.1(p) High wind dust event is an event that includes the high-speed wind and the dust that the wind entrains and transports to a monitoring site.

FIGURE 2-27
96-HOUR PM₁₀ CONCENTRATIONS AT VARIOUS SITES

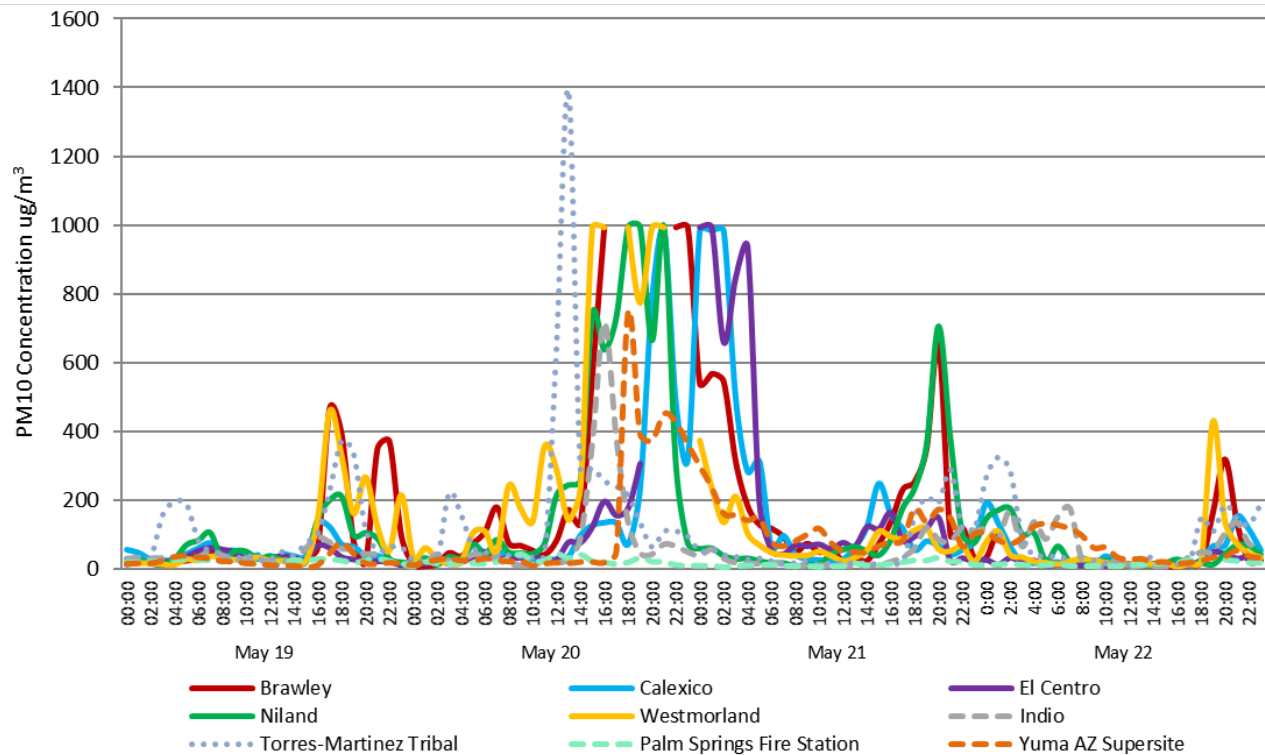


Fig 2-27: Is the graphical representation of the 96 hour relative PM₁₀ concentrations at various sites in California and Arizona. The elevated PM₁₀ concentrations at all sites on May 20, 2016 and May 21, 2016, demonstrate the regional impact of the weather system and accompanying winds. Air quality data from the EPA's AQS data bank

III Historical Concentrations

III.1 Analysis

While naturally occurring high wind events may recur seasonally and at times frequently and qualify for exclusion under the EER, historical comparisons of the particulate concentrations and associated winds provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM₁₀ concentrations measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors on May 20 and May 21, 2016, were compared to non-event and event days demonstrating the variability over several years and seasons. The analysis, also, provides supporting evidence that there exists a clear causal relationship between the May 20 and May 21, 2016 high wind event and the exceedance measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors.

Figures 3-1 through 3-10 show the time series of available FRM and BAM 24-hr PM₁₀ concentrations at the Brawley, Calexico, El Centro, Niland, and Westmorland stations for the period of January 1, 2010 through May 21, 2016. Note that prior to 2013, the BAM data was not considered FEM and was not reported into AQS.⁶ In order to properly establish the variability of the event as it occurred on May 20 and May 21, 2016, 24-hour averaged PM₁₀ concentrations between January 1, 2010 and May 21, 2016 were compiled and plotted as a time series. All figures illustrate that the exceedance, which occurred on May 20 and May 21, 2016 were outside the normal historical concentrations when compared to event and non-event days. Air quality data for all graphs was obtained through the EPA's AQS data bank.

⁶ Pollutant concentration data contained in EPA's Air Quality System (AQS) are required to be reported in units corrected to standard temperature and pressure (25 C, 760 mm Hg). Because the PM₁₀ concentrations prior to 2013 were not reported into the AQS database all BAM (FEM) data prior to 2013 within this report are expressed as micrograms per cubic meter (mg/m³) at local temperature and pressure (LTP) as opposed to standard temperature and pressure (STP, 760 torr and 25 C). The difference in concentration measurements between standard conditions and local conditions is insignificant and does not alter or cause any significant changes in conclusions to comparisons of PM₁₀ concentrations to PM₁₀ concentrations with in this demonstration.

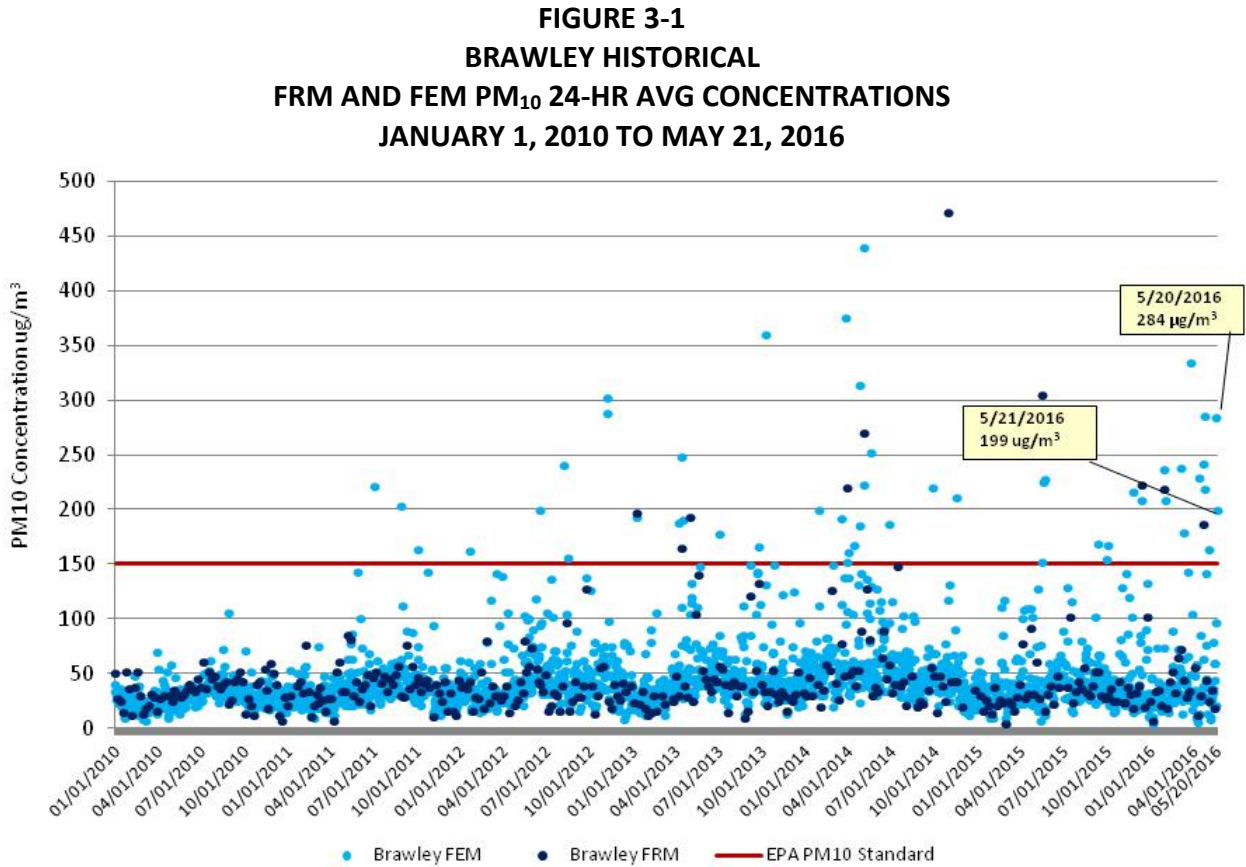


Fig 3-1: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 284 µg/m³ on May 20 and 199 µg/m³ on May 21 by the Brawley BAM 1020 PM₁₀ monitor were outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold.

FIGURE 3-2
CALEXICO FRM AND FEM PM₁₀ 24-HR AVG
HISTORICAL CONCENTRATIONS
JANUARY 1, 2010 TO MAY 21, 2016

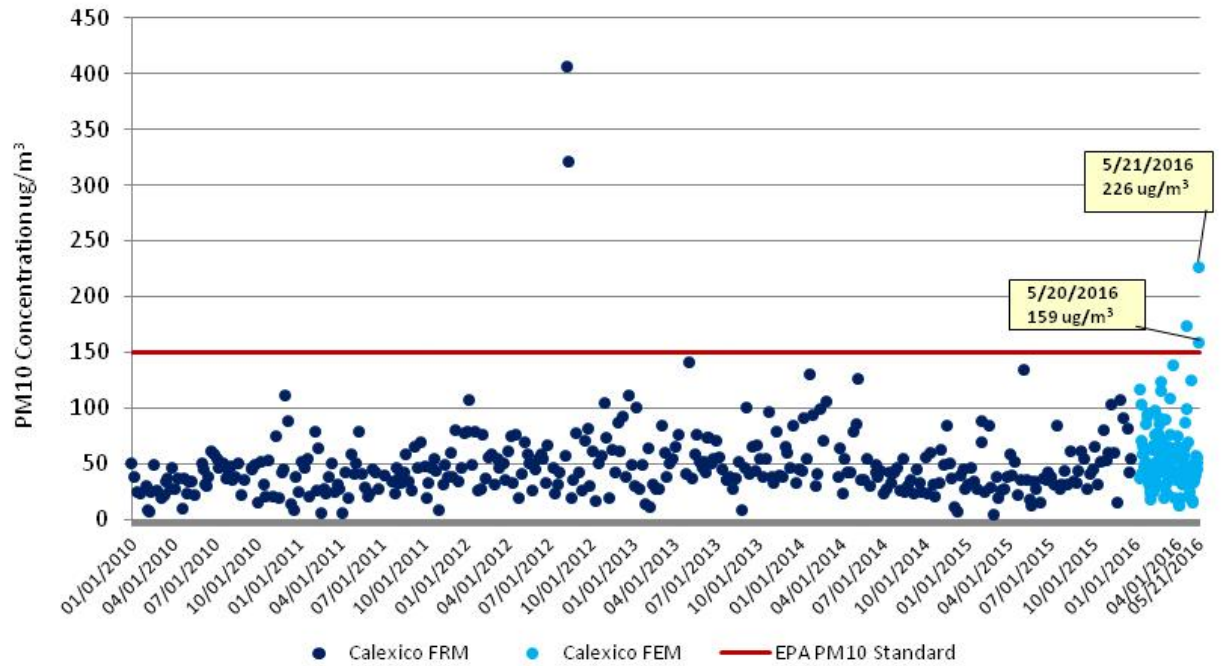


Fig 3-2: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 159 $\mu\text{g}/\text{m}^3$ on May 20 and 226 $\mu\text{g}/\text{m}^3$ on May 21 by the Calexico BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold.

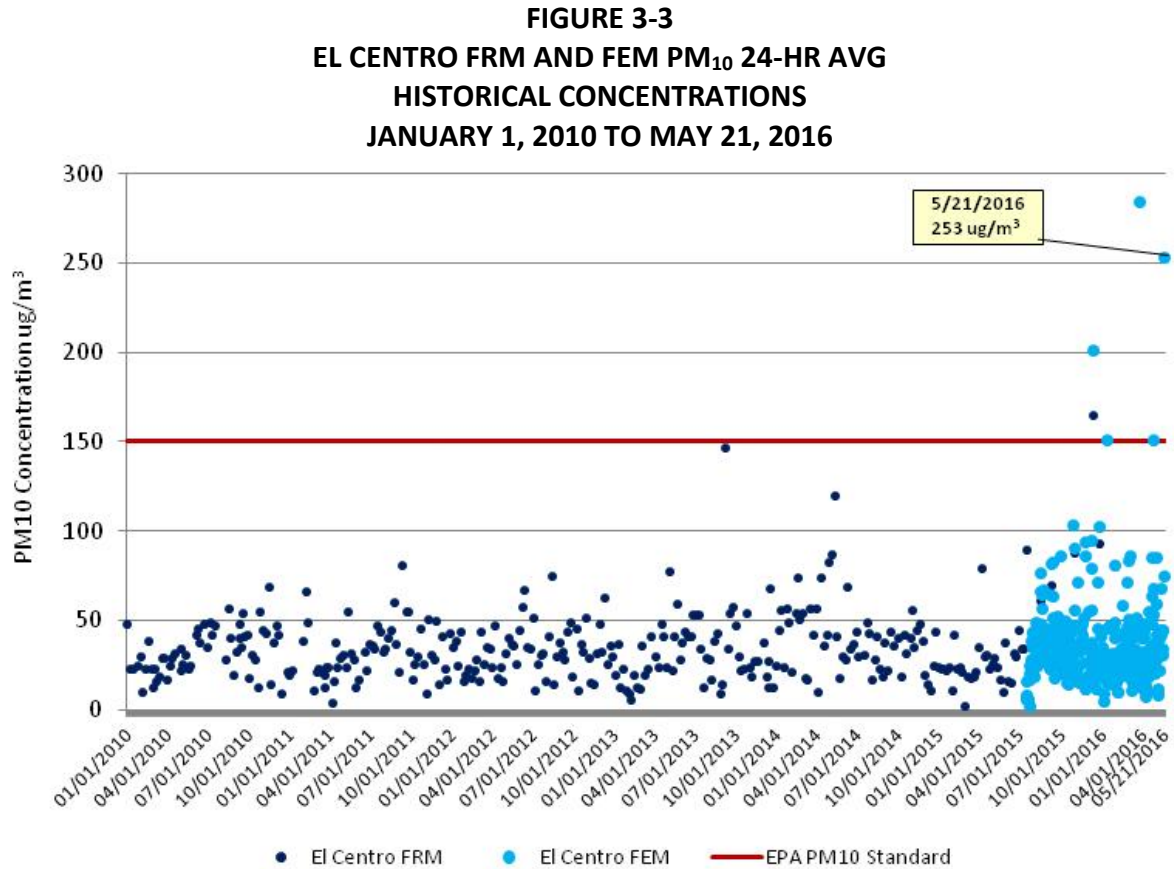


Fig 3-3: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 253 $\mu\text{g}/\text{m}^3$ on May 21 by the El Centro BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold.

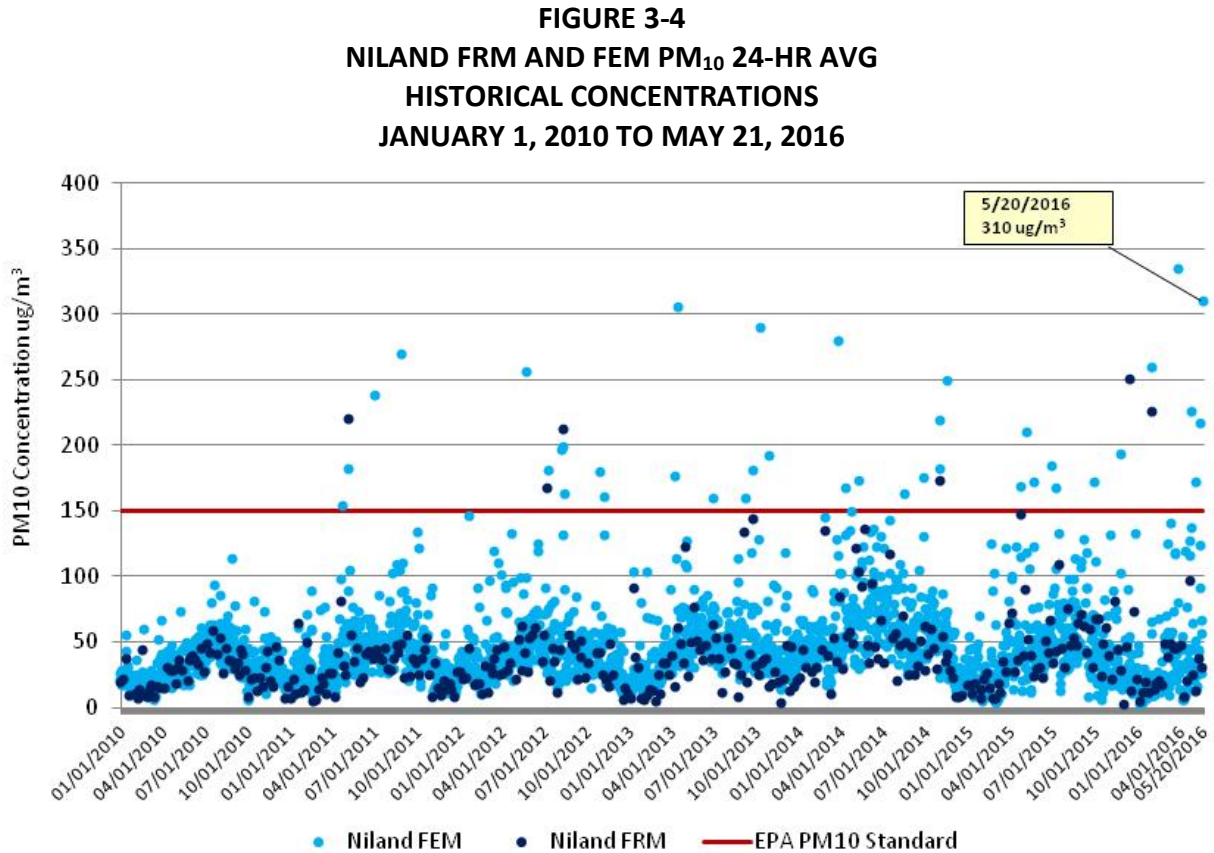


Fig 3-4: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 310 $\mu\text{g}/\text{m}^3$ on May 20 by the Niland BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold.

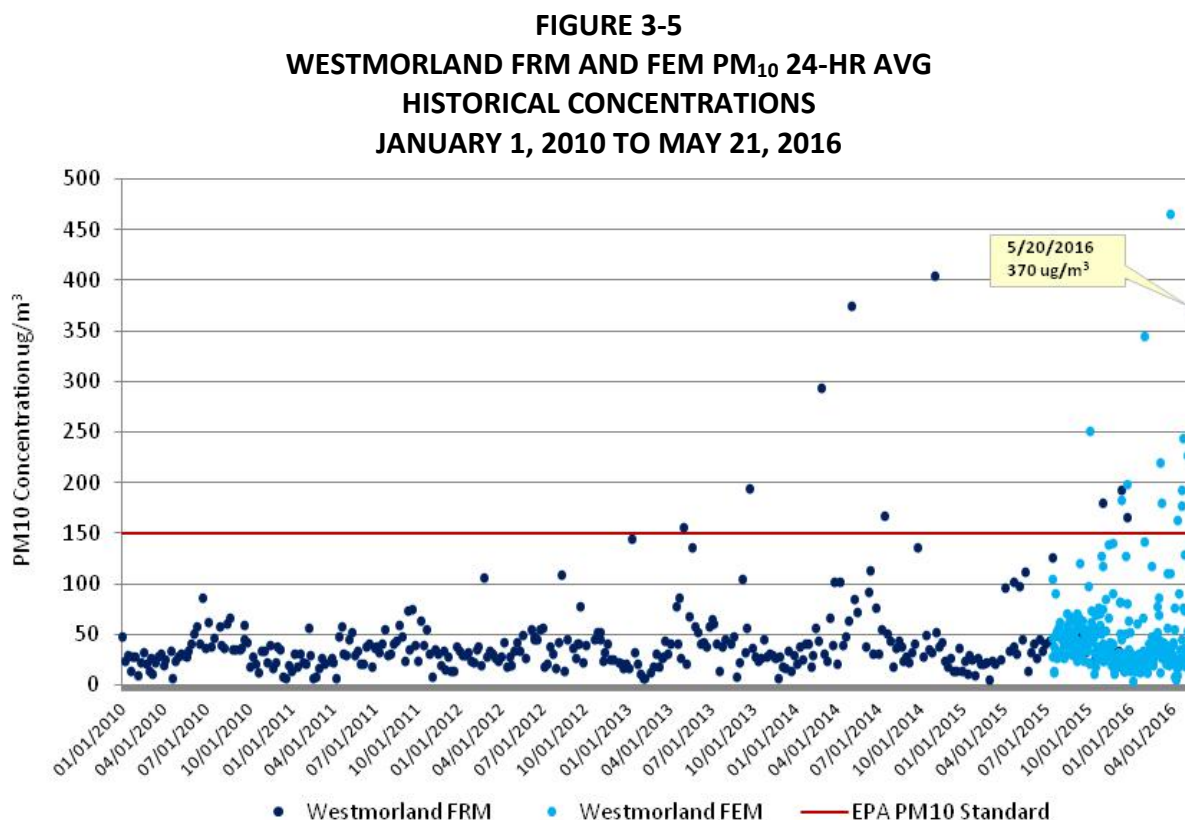


Fig 3-5: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentrations of 370 $\mu\text{g}/\text{m}^3$ on May 20 by the Westmorland BAM 1020 PM₁₀ monitor were outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold.

The time series, **Figures 3-1 through 3-5** for Brawley, Calexico, El Centro, Niland, and Westmorland included 2,333 sampling days (January 1, 2010 through May 21, 2016). During this period the Brawley station (**Figure 3-1**) measured 2,431 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and May 21, 2016. Overall, the time series illustrates that of the 2,702 credible samples measured during there was a total of 49 exceedance days, which is a 1.8% occurrence rate. Calexico (**Figure 3-2**) measured 489 credible samples measured by either FRM or FEM monitors during this period (FEM sampling commenced on January 2016) the station measured five exceedance days. This translates into 1.0% of all samples. El Centro (**Figure 3-2**) measured 666 credible samples measured by either FRM or FEM monitors during this period while the station measured three exceedance days. This translates into 0.5% of all samples. Niland (**Figure 3-3**) measured 2,700 credible samples measured by either FRM or FEM monitors during this period while the station measured 43 exceedance days. This translates into 1.6% of all samples. Westmorland (**Figure 3-4**) measured 669 credible samples measured by either FRM or FEM monitors during this period (FEM sampling began July 2015) and measured 20 exceedance days. This equates to 3.0% of all samples. Clearly, exceedances by any of the monitoring stations over a historical period is a rare event.

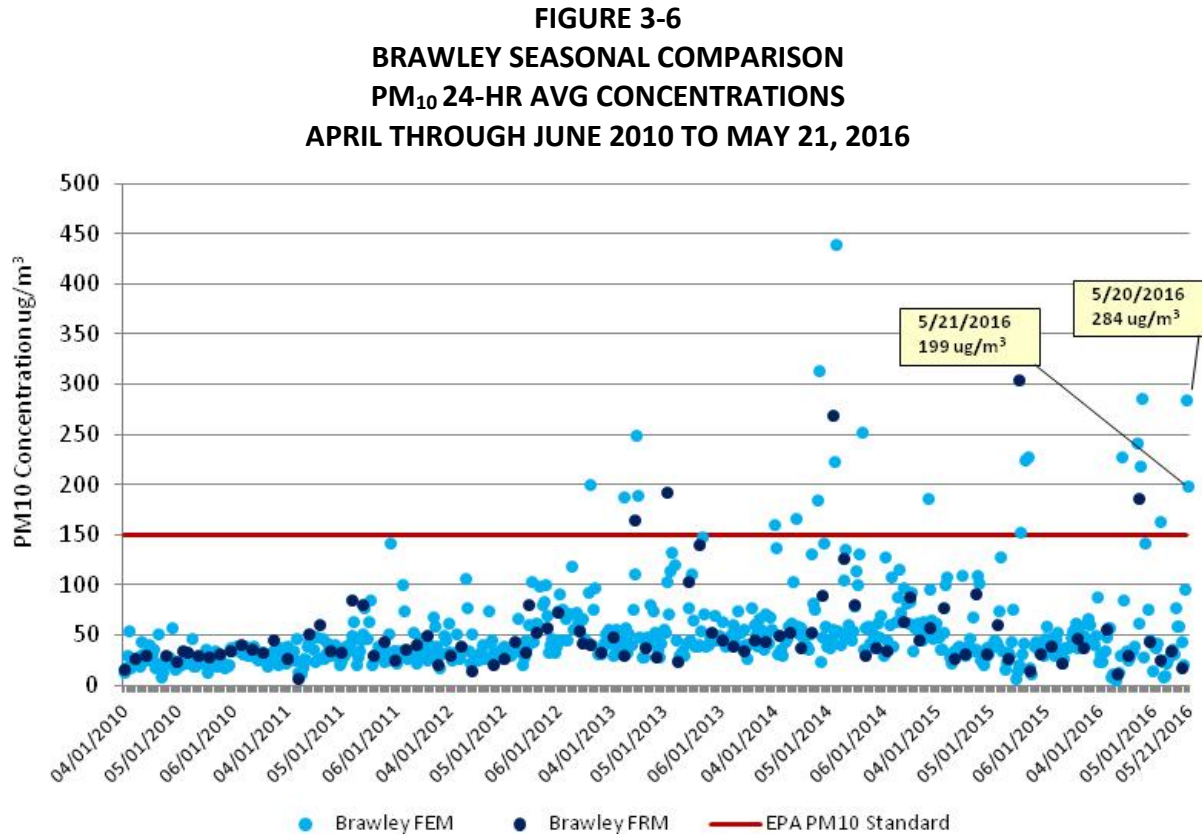


Fig 3-6: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 284 $\mu\text{g}/\text{m}^3$ on May 20 and 199 $\mu\text{g}/\text{m}^3$ on May 21 by the Brawley BAM 1020 PM₁₀ monitor were outside the normal historical concentrations when compared to similar days and non-event days. The far vast number of samples fall way below the exceedance threshold

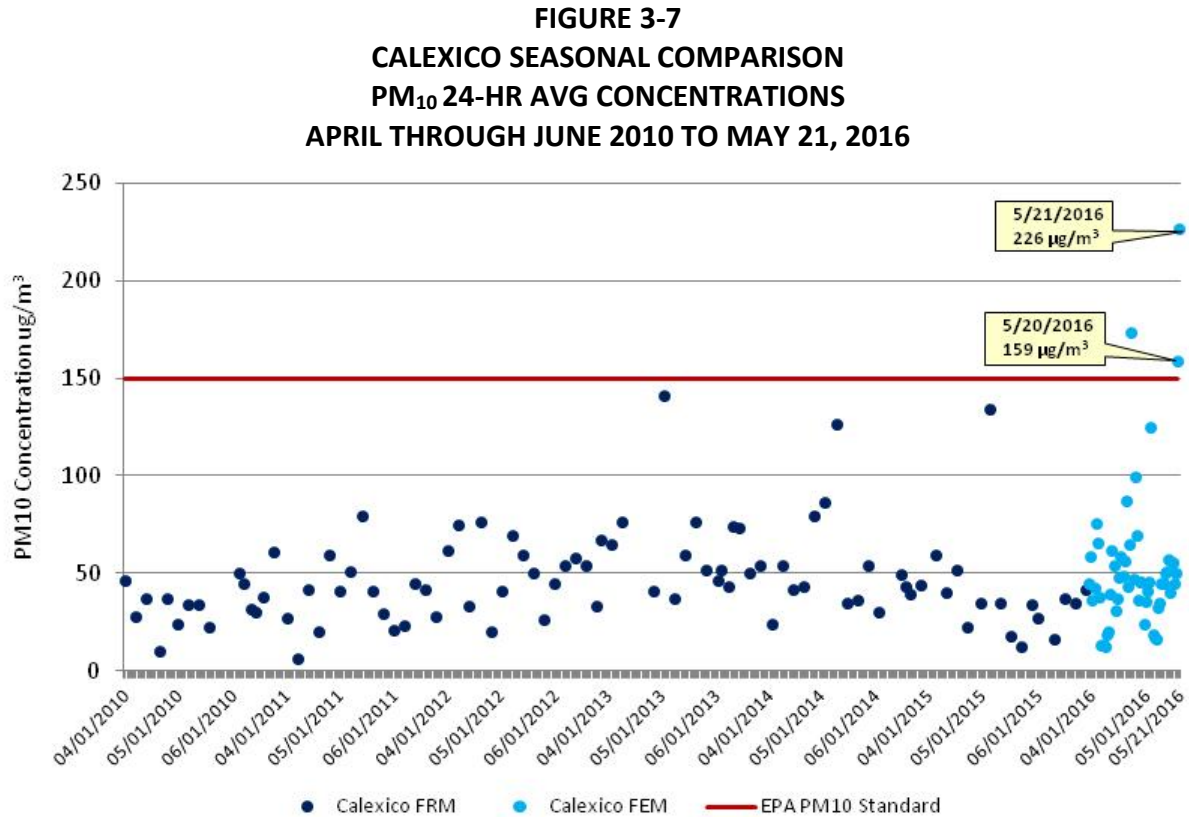


Fig 3-7: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 159 $\mu\text{g}/\text{m}^3$ on May 20 and 226 $\mu\text{g}/\text{m}^3$ on May 21 by the Calexico BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold

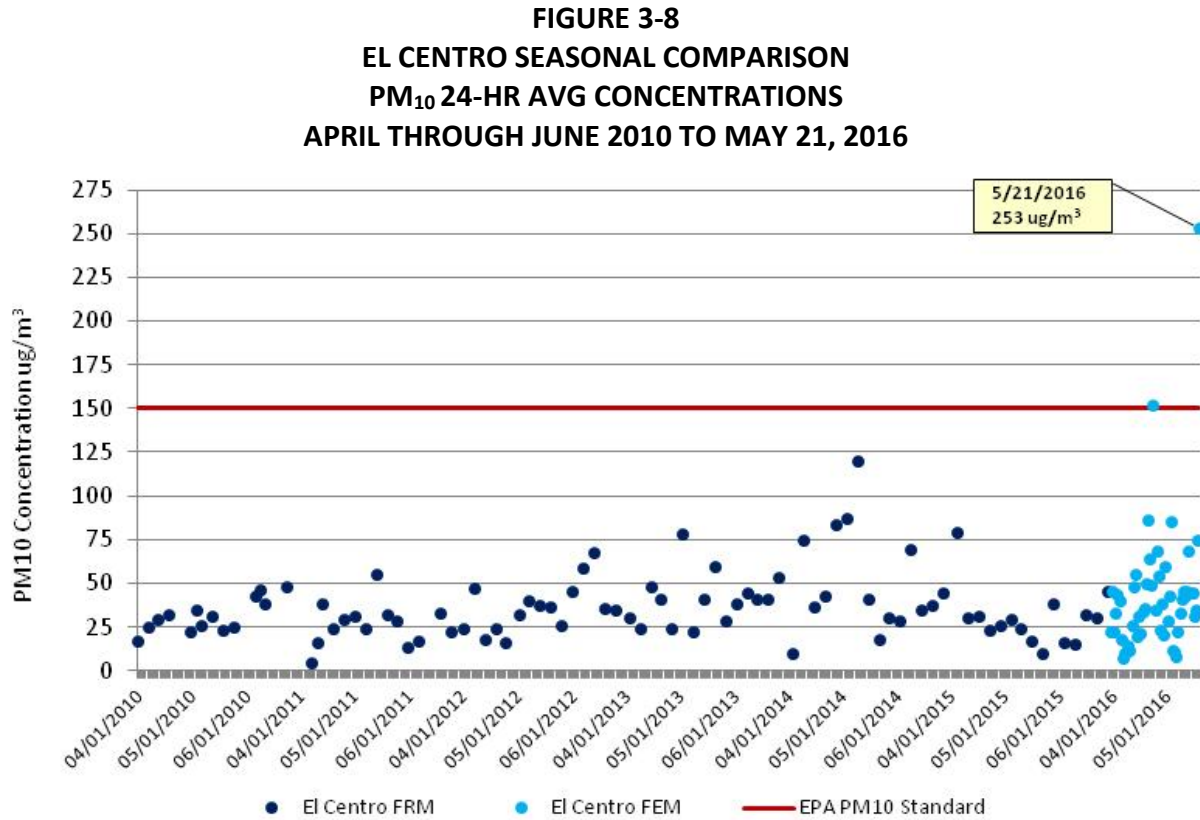


Fig. 3-8: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 253 $\mu\text{g}/\text{m}^3$ on May 21 by the El Centro BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold

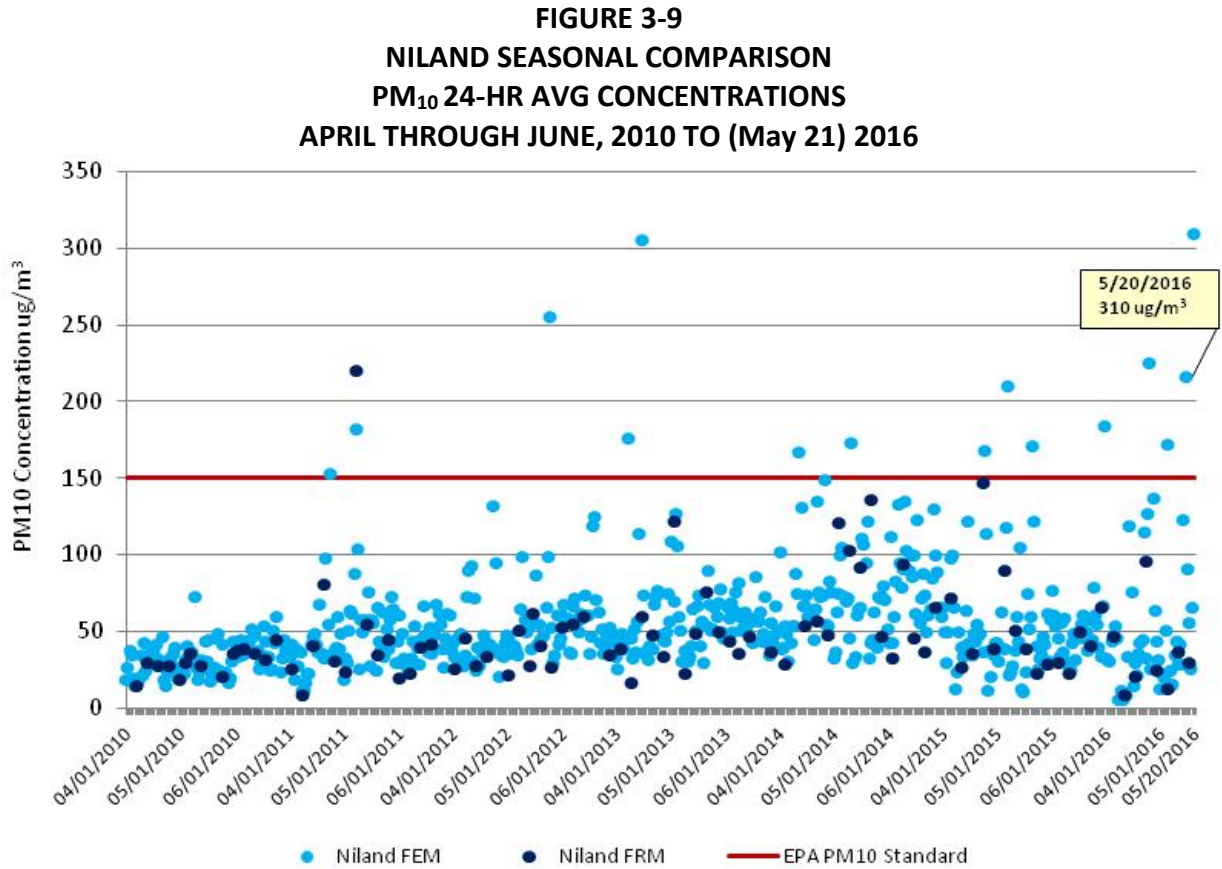


Fig 3-9: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentration of 310 $\mu\text{g}/\text{m}^3$ on May 20 by the Niland BAM 1020 PM₁₀ monitor was outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold

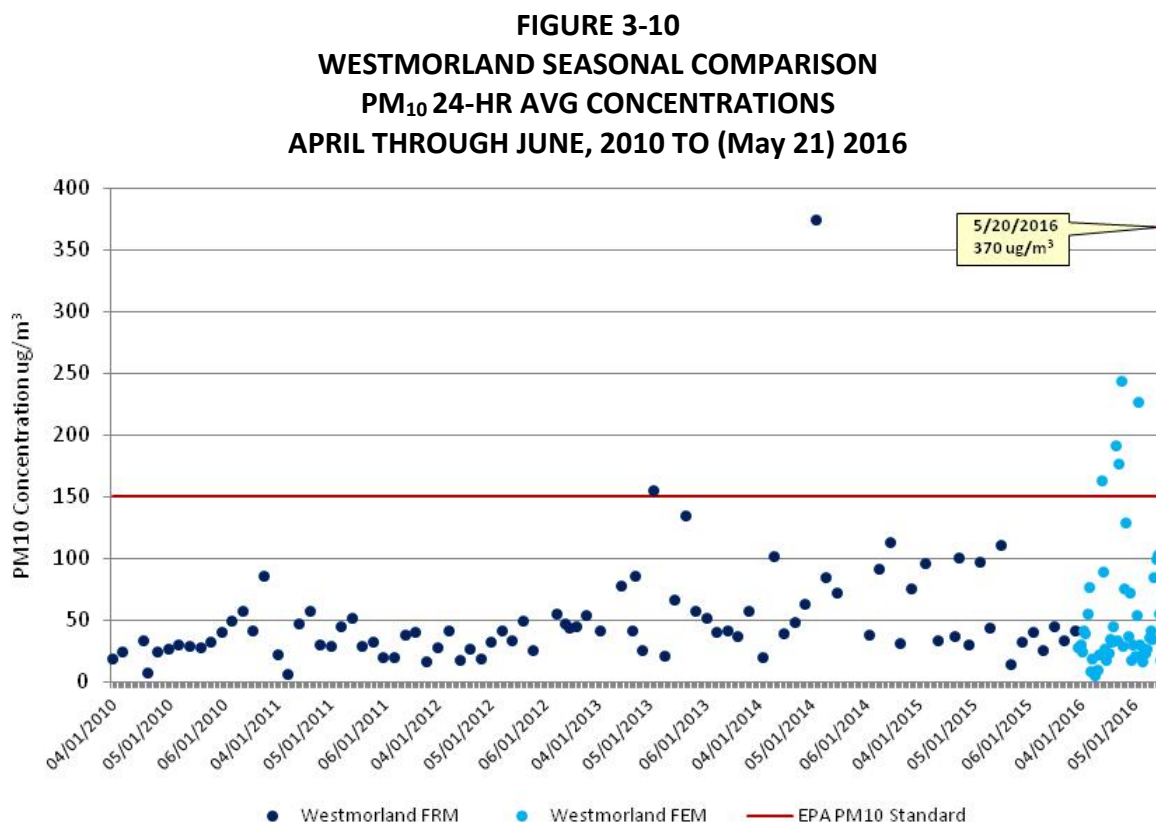


Fig 3-10: A comparison of PM₁₀ historical concentrations demonstrates that the measured concentrations of 370 $\mu\text{g}/\text{m}^3$ on May 20 by the Westmorland BAM 1020 PM₁₀ monitor were outside the normal historical measurements. The far vast number of samples fall way below the exceedance threshold

Figures 3-6 through 3-10 display the seasonal fluctuations over 597 sampling days at the Brawley, Calexico, El Centro, Niland, and Westmorland stations for months April through June of years 2010 through 2016 (2016 ending May 21). The seasonal sampling period for Brawley (**Figure 3-6**) contains 693 combined FRM and FEM samples. Of these, 22 exceedances occurred during the second quarter which translates into 3.2% of all samples. The seasonal sampling period for Calexico (**Figure 3-7**) contains 143 credible samples and only three exceedance days. This translates into 2.1% of all samples. The seasonal sampling period for El Centro station (**Figure 3-8**)⁷ contains 232 credible samples and one exceedance day, or 0.4% of all samples. The seasonal sampling period for Niland (**Figure 3-9**) measured 690 credible samples and 17 exceedance days during the historical second-quarter period. This equates to just 2.5% of all samples. The seasonal sampling period for Westmorland station (**Figure 3-10**)⁸ contains 139 credible samples and eight exceedance days, or 5.8% of all samples.

⁷ FEM sampling at the El Centro site began July 2015 therefore January is the only seasonal first-quarter data available.

⁸ FEM sampling at the Westmorland site began July 2015 therefore January is the only seasonal first-quarter data available.

Figures 3-11 through 3-15 display percentile rankings for Brawley, Calexico, El Centro, Niland, and Westmorland over the historical period of January 2010 through May 21, 2016.

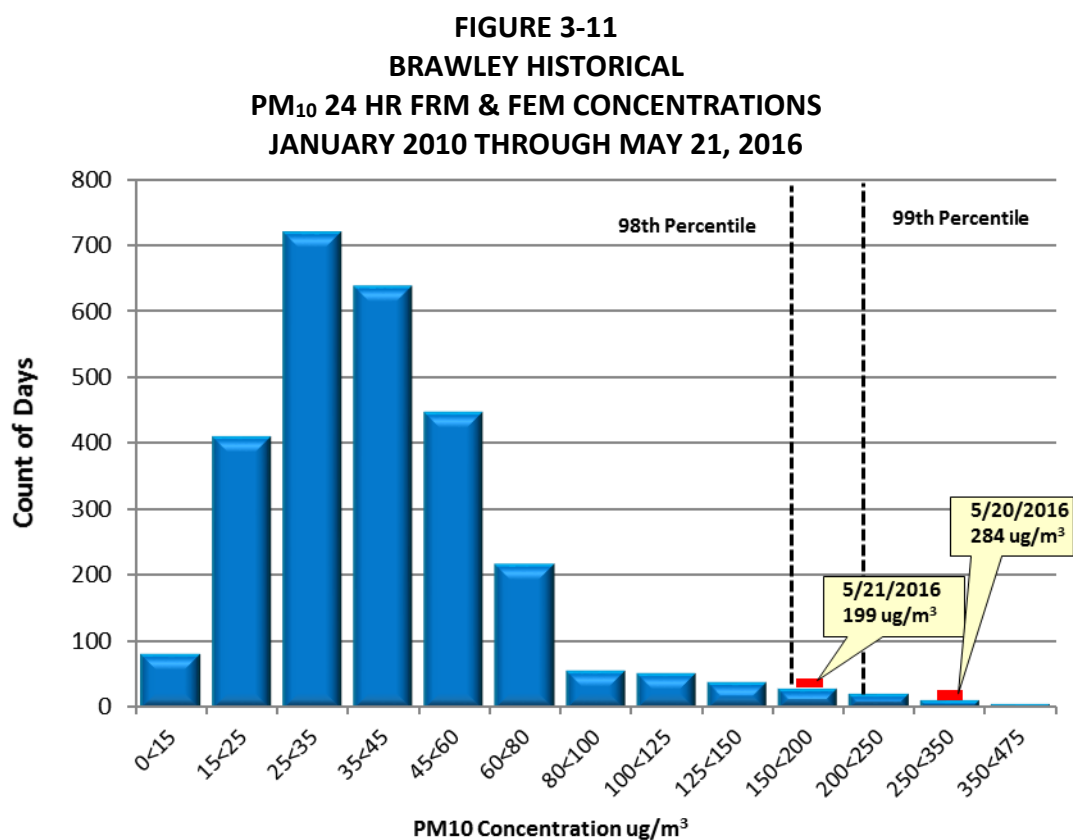


Fig 3-11: The 24-hr average PM₁₀ concentration at the Brawley monitoring site demonstrates that the concentrations of 284 $\mu\text{g}/\text{m}^3$ on May 20, 2016 was in excess of the 99th percentile, while the concentration of 199 $\mu\text{g}/\text{m}^3$ on May 21, 2016 fell above the 98th percentile

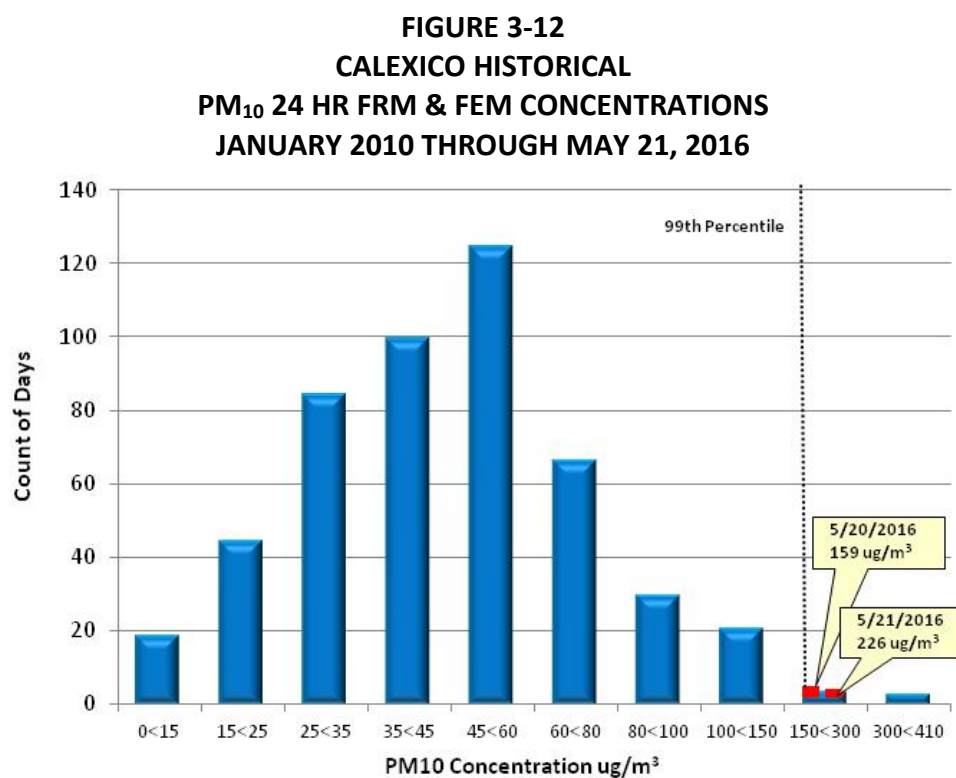


Fig 3-12: The 24-hr average PM₁₀ concentration at the Callexico monitoring site demonstrates that the concentration of 159 µg/m³ on May 20, 2016 and the concentration of 226 µg/m³ on May 21, 2016 were in excess of the 99th percentile

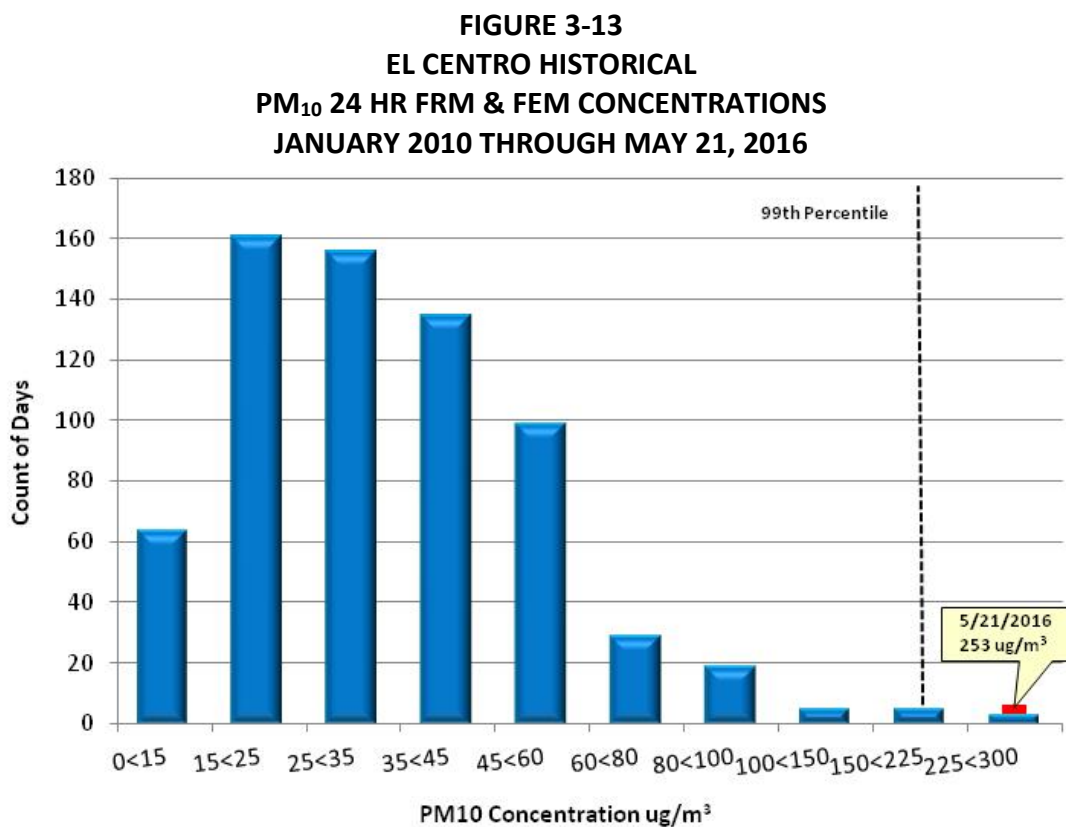


Fig 3-13: The 24-hr average PM₁₀ concentration at the Calexico monitoring site demonstrates that the concentration of 253 µg/m³ on May 21, 2016 was in excess of the 99th percentile

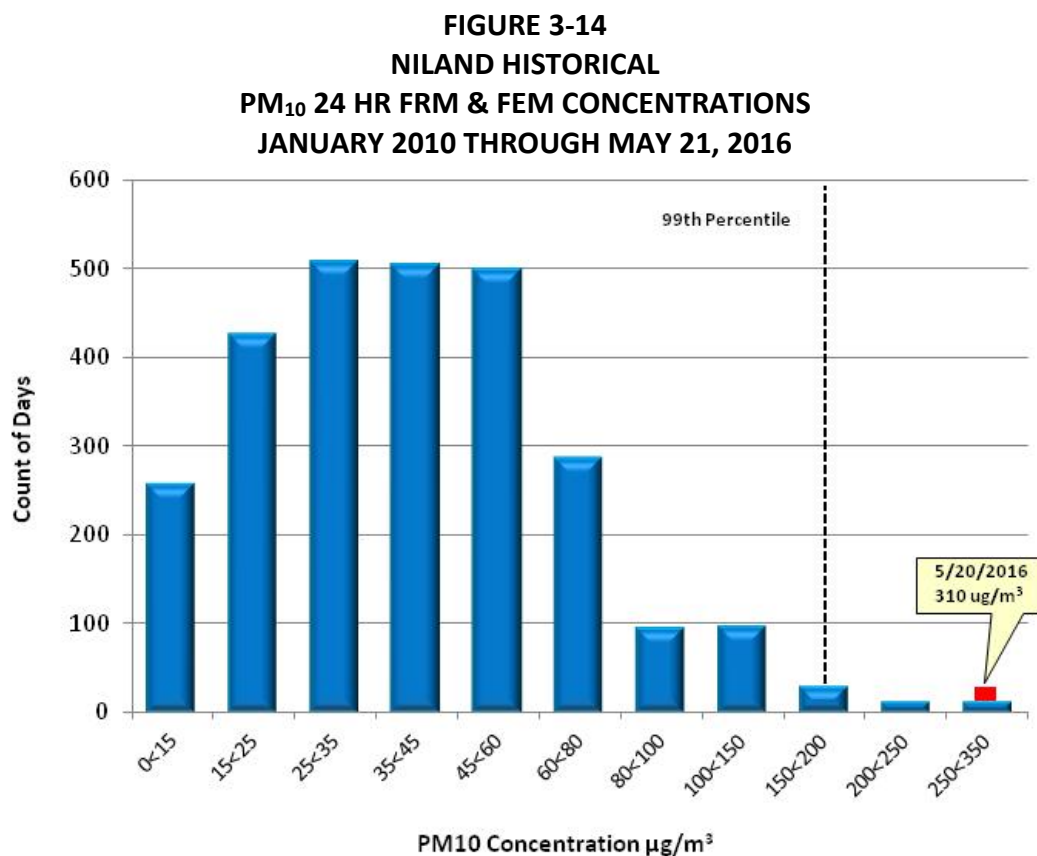


Fig 3-14: The 24-hr average PM₁₀ concentration at the Niland monitoring site demonstrates that the concentration of 310 µg/m³ on May 20, 2016 was in excess of the 99th percentile

FIGURE 3-15
WESTMORLAND HISTORICAL
PM₁₀ 24 HR FRM & FEM CONCENTRATIONS
JANUARY 2010 THROUGH MAY 21, 2016

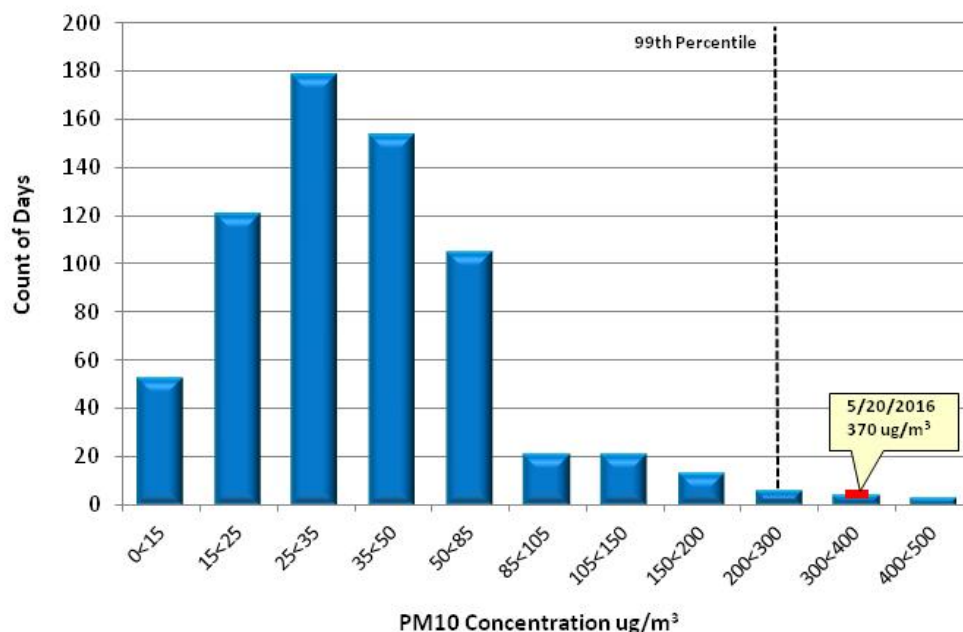


Fig 3-15: The 24-hr average PM₁₀ concentration at the Westmorland monitoring site demonstrates that the concentration of 370 µg/m³ on May 20 was in excess of the 99th percentile.

For the combined FRM and FEM data sets the annual historical and the seasonal historical PM₁₀ concentrations of 284 µg/m³, 159 µg/m³, 226 µg/m³, 252 µg/m³, 211 µg/m³, 370 µg/m³ for Brawley, Calexico, El Centro, Niland, and Westmorland are all above the 99th percentile ranking, while the concentration of 199 µg/m³ for Brawley is above the 98th percentile ranking. Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasonal patterns, the May 20 and May 21, 2016 measured exceedances are clearly outside the normal concentration levels when comparing to non-event days and event days.

III.2 Summary

The information provided, above, by the time series plots, seasonal time series plots, and the percentile rankings illustrate that the PM₁₀ concentration observed on May 20 and May 21, 2016 occurs infrequently. When comparing the measured PM₁₀ levels on May 20 and May 21, 2016 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitoring sites were outside the normal historical and seasonal historical concentration levels.

The historical concentration analysis provided here supports the determination that the May 20 and May 21, 2016 natural event affected the concentrations levels at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors causing an exceedance. The concentration analysis further supports that the natural event affected air quality in such a way that there exists a clear causal relationship between the measured exceedances on May 20 and May 21, 2016 and the natural event, qualifying the natural event as an Exceptional Event.

IV Not Reasonably Controllable or Preventable

According to the October 3, 2016 promulgated revision to the Exceptional Event (EE) rule under 40 CFR §50.14(b)(8) air agencies must address the “not reasonably controllable or preventable” (nRCP) criterion as two prongs. In order to properly address the nRCP criterion the ICAPCD must not only identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance but must identify the relevant State Implementation Plan (SIP) measures and/or other enforceable control measures in place for the identified sources. An effective analysis of the nRCP must include the implementation status of the control measures in order to properly consider the measures as enforceable. USEPA considers control measures to be enforceable if approved into the SIP within 5 years of an EE demonstration submittal. The identified control measures must address those specific sources that are identified as causing or contributing to a monitored exceedance.

The final EE rule revision explains that an event is considered not reasonably controllable if reasonable measures to control the impact of the event on air quality were applied at the time of the event. Similarly, an event is considered not reasonably preventable if reasonable measures to prevent the event were applied at the time of the event. However, for “high wind events” when PM₁₀ concentrations are due to dust raised by high winds from desert areas whose sources are controlled with Best Available Control Measures (BACM) then the event is a “natural event” where human activity plays little or no direct causal role and thus is considered not preventable.

This section begins by providing background information on all SIP and other enforceable control measures in force during the EE for May 20, 2016 and May 21, 2016. In addition, this May 20, 2016 and May 21, 2016 demonstration provides technical and non-technical evidence that strong and gusty westerly winds blew across the mountains and deserts within southeastern California and into Imperial County suspending particulate matter affecting the Brawley, Calexico, El Centro, Niland, and Westmorland monitors on May 20, 2016 and May 21, 2016. This section identifies all natural and anthropogenic sources and provides regulatory evidence of the enforceability of the control measures in place during the May 20, 2016 and May 21, 2016 EE.

IV.1 Background

Inhalable particulate matter (PM₁₀) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM₁₀ NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM₁₀ from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM₁₀. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006 ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

**FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT**

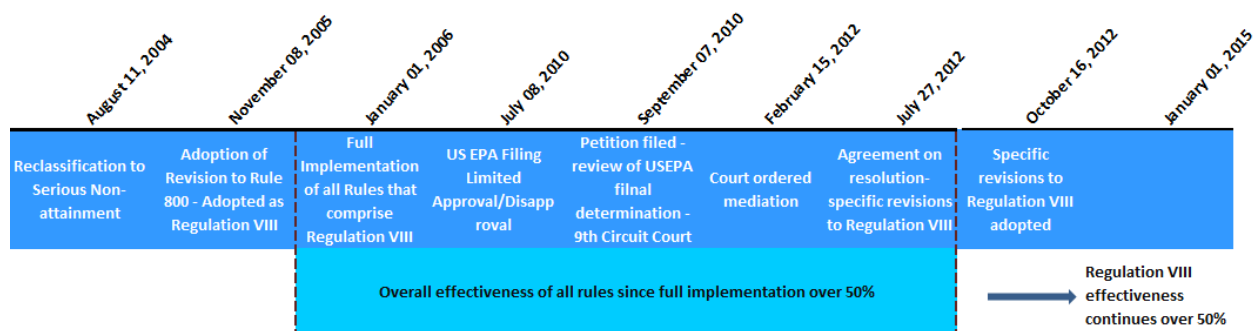


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII which is comprised of seven fugitive dust rules is found below. **Appendix D** contains a complete set of the Regulation VIII rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM₁₀ from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generates dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM₁₀ events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On May 20 and May 21, 2016 the ICAPCD declared a No Burn day (**Appendix A**). No complaints were filed for agricultural burning on May 20 and May 21, 2016.

IV.1.c Review of Source Permitted Inspections and Public Complaints

A query of the ICAPCD permit database was compiled and reviewed for active permitted sources throughout Imperial County, specifically around Brawley, Calexico, El Centro, Niland, and Westmorland during the May 20, 2016 and May 21, 2016 PM₁₀ exceedance. Both permitted and non-permitted sources are required to comply with Regulation VIII requirements that address fugitive dust emissions. The identified permitted sources are Aggregate Products, Inc., US Gypsum Quarry, Imperial Aggregates (Val-Rock, Inc., and Granite Construction), US Gypsum Plaster City, Clean Harbors (Laidlaw Environmental Services), Bullfrog Farms (Dairy), Burrtec Waste Industries, Border Patrol Inspection station, Centinela State Prison, various

communications towers not listed and various agricultural operations. Non-permitted sources include the wind farm known as Ocotillo Express, and a solar facility known as CSolar IV West. Finally, the desert regions are under the jurisdiction of the Bureau of Land Management and the California Department of Parks (Including Anza Borrego State Park and Ocotillo Wells).

An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM₁₀ emissions. There were no complaints filed on May 20, 2016 or May 21, 2016, officially declared as No Burn days, related to agricultural burning, waste burning or dust.

FIGURE 4-2
PERMITTED SOURCES

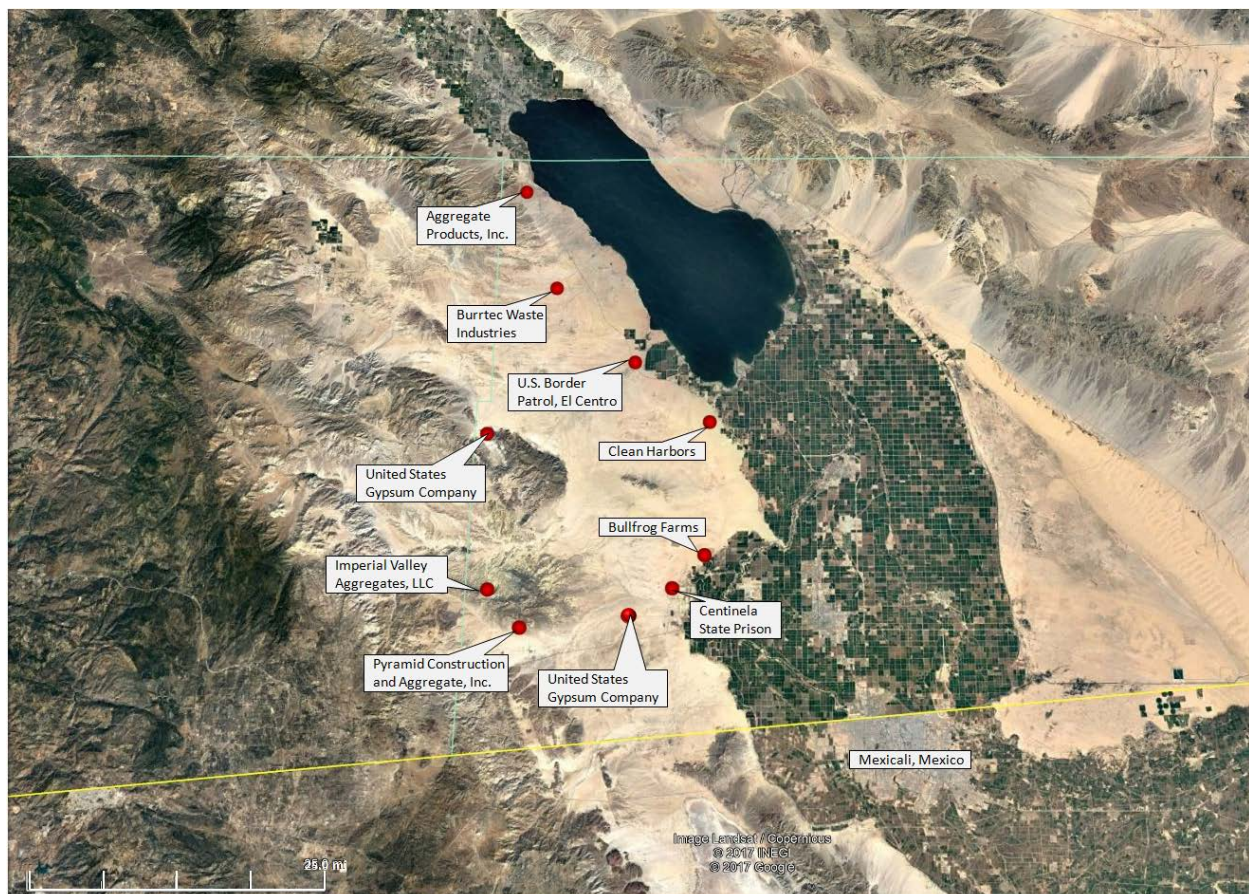


Fig 4-2: The above map identifies those permitted sources located west, northwest and southwest the monitors in Imperial County. The green line to the north denotes the political division between Imperial and Riverside counties. The yellow line below denotes the international border between the United States and Mexico. The green checker-boarded areas are a mixed use of agricultural and community parcels. In addition, the desert areas are managed either by the Bureau of Land Management or the California Department of Parks. Base map from Google Earth.

FIGURE 4-3
NON-PERMITTED SOURCES

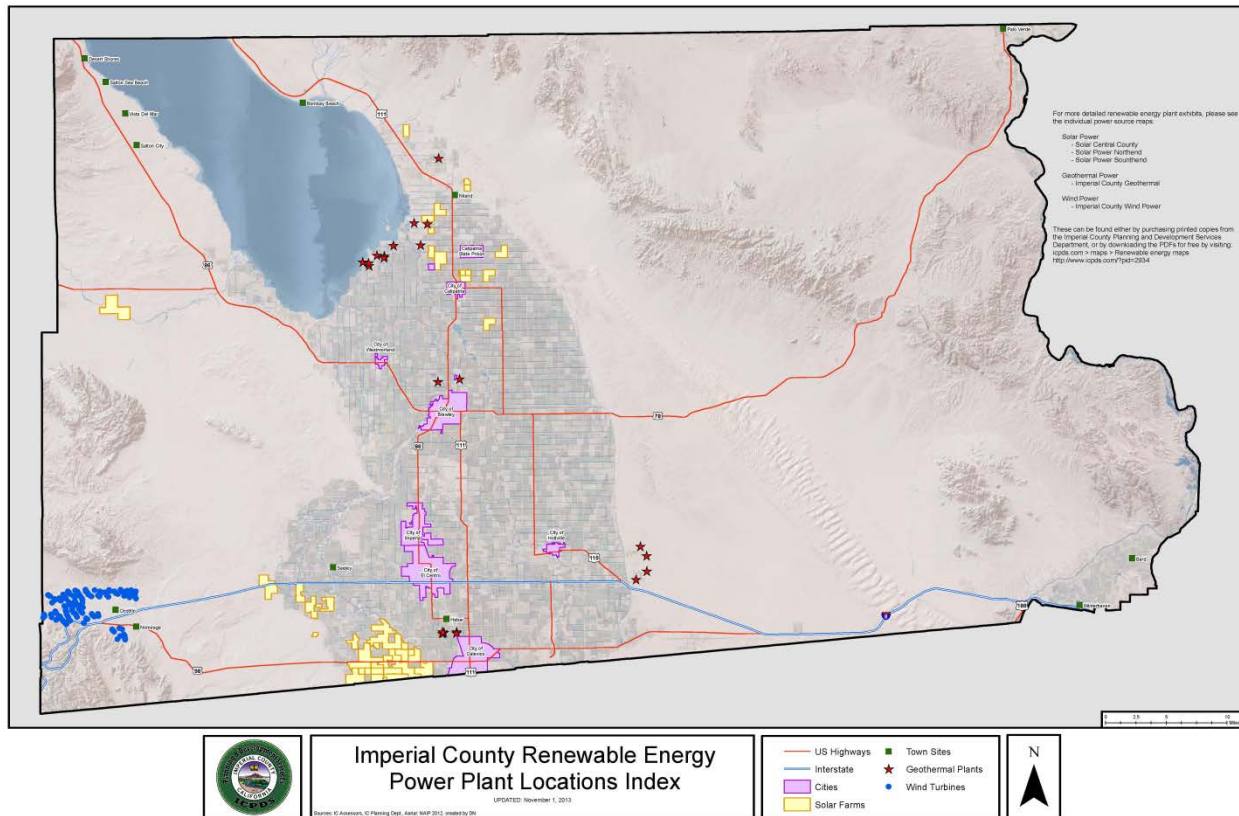


Fig 4-3: The above map identifies those power sources located west, northwest and southwest the monitors in Imperial County. Blue indicate the Wind Turbines, Yellow are the solar farms and stars are geothermal plants.

IV.2 Forecasts and Warnings

ICAPCD's provided notice on its webpage on Friday, May 19, 2016 explaining that a large and strong Pacific weather disturbance would begin to move through the region and bring windy conditions from southern California to western Arizona through May 21. A Wind Advisory⁹ for a large portion of southeastern California that included Imperial County was issued at 14:17 PST on May 19 in anticipation of the high winds that would be generated by the approaching weather system. Southwest winds of 20 to 30 mph with gusts up to 40 mph were forecasted. Earlier, at 02:39 on May 19, a Wind Advisory was issued for a wide portion of San Diego County that included the San Diego deserts immediately upstream of Imperial County. Winds reaching 35 mph with gusts up to 50 mph were forecasted. Visibility was expected to be reduced to less than

⁹ A wind advisory is issued when the following conditions are met for one (1) hour or longer: 1) sustained winds of 31 to 39 mph, and/or; 2) wind gusts of 46 to 57 mph for any duration. Source: NWS, 2016; <http://www.weather.gov/lwx/WarningsDefined#WindAdvisory>.

three miles due to blowing dust and sand. At 21:56 PST on May 20 a Blowing Dust Advisory¹⁰ was issued for Imperial County. Visibility was expected to fall below one mile due to dense blowing dust. On May 21 at 00:04 PST the Blowing Dust Advisory for Imperial County was extended through 02:00. Hazardous driving was expected due to dangerous cross winds and blowing dust and sand. At 13:24 PST the Wind Advisory was extended through 22:00 PST. See **Appendix A** for weather forecasts and advisories.

Aside from posting forecasts and advisories on its website, the ICAPCD webpage notice also carried an advisory that high winds had the potential to suspend particulate matter into the air, and possibly pose an impact to public health. **Appendix A** contains copies of pertinent notices to the May 20, 2016 and May 21, 2016 event.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County (**Table 2-2**). Data were also collected from automated meteorological instruments that were upstream from the Brawley, Calexico, El Centro, Niland, and Westmorland monitors during the wind event. On May 20, 2016 El Centro NAF (KNJK) had 12 hours of winds at or above 25 mph, with 13 of those hours with winds above 30 mph. Peak gusts reached 51 mph. Imperial County Airport (KIPL) had four hours of winds at or above 25 mph, with nine hours of gusts at or above 30 mph. On May 21, 2016 Centro NAF (KNJK) had 12 hours of winds at or above 25 mph and four hours of winds at or above 30 mph. Imperial County Airport (KIPL) had three hours of winds above 25 mph, with seven hours of gusts at or above 30 mph. Multiple stations reported winds at or above the 25 mph threshold. Niland (English Rd) reported winds over 25 mph on both May 20, 2016 and May 21. Wind speeds of 25 mph are normally sufficient to overcome most PM₁₀ control measures. During the May 20, 2016 and May 21, 2016 event wind speeds were above the 25 mph threshold, overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that high winds accompanying a strong low pressure system that moved through southern California entrained dust that caused uncontrollable PM₁₀ emissions. The BACM list as part of the control measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM₁₀, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements at or upstream of Brawley, Calexico, El Centro, Niland, and Westmorland monitoring stations during the event were high enough (at or above 25 mph, with wind gusts of 51 mph) that BACM PM₁₀ control measures would have been overwhelmed.

¹⁰ Blowing Dust Advisory is issued when blowing dust is expected to reduce visibility to between 1/4 and 1 mile, generally with winds of 25 mph or greater. <https://www.weather.gov/oun/spotter-wwa-definitions>.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on May 20, 2016 and May 21, 2016 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The May 20, 2016 and May 21, 2016 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for May 20, 2016 and May 21, 2016 identified a large Pacific weather disturbance that moved into the western states with associated gusty westerly winds as the low pressure system moved inland and over the region. As the low deepened it strengthened surface gradients which created a strong onshore flow which led to gusty westerly winds across the mountains and deserts of southeast California and into Imperial County.

Entrained windblown dust from natural areas, particularly from the desert areas west of the Brawley, Calexico, El Centro, Niland and Westmorland air quality monitoring stations, along with anthropogenic sources controlled with BACM, is confirmed by the meteorological and air quality observations on May 20, 2016 and May 21, 2016. Entrained dust emissions blew over the San Diego mountain passes as early as the evening of May 19, 2016 on through May 21, 2016 affecting air quality and causing an exceedance of the NAAQS at all five air quality monitoring stations in Imperial County.

Figures 5-1 and 5-2 provide information regarding the pressure gradients over southeast California and the resulting surface winds across the region.

FIGURE 5-1
STEEP GRADIENT OVER SOUTHEAST CALIFORNIA

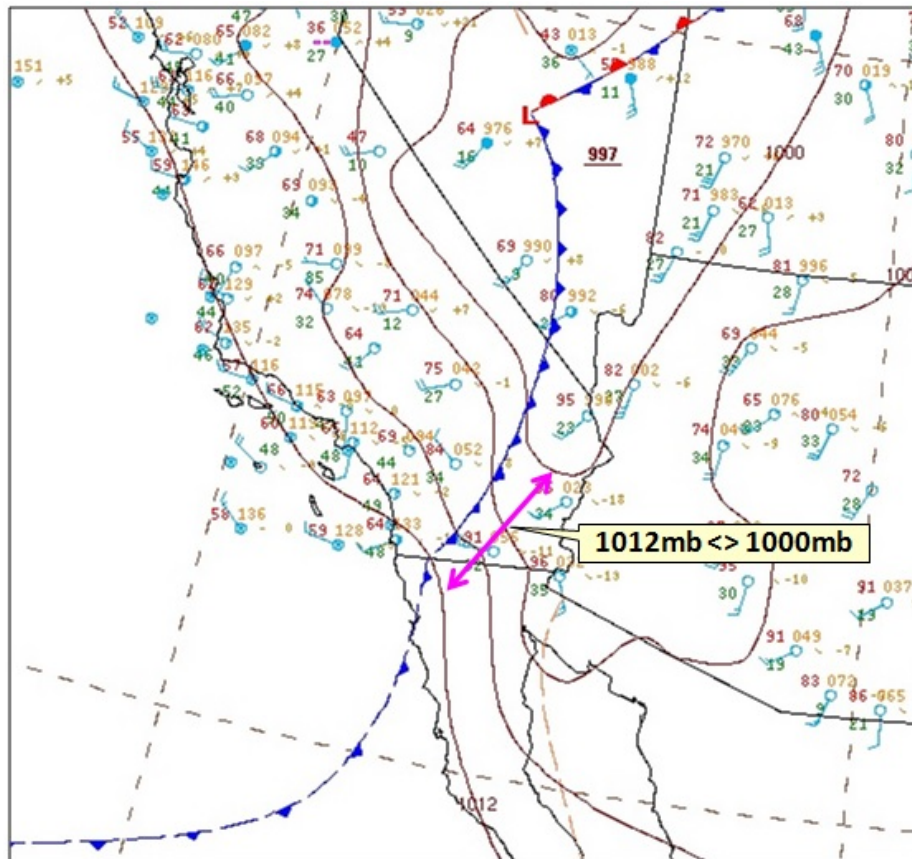


Fig 5-1: Steep pressure gradients created a strong onshore flow over the region. The resulting gusty winds were responsible for lofting dust that caused the exceedances over a two-day period. Source: WPC Surface Analysis Archive.

FIGURE 5-2
HIGH WINDS IN IMPERIAL COUNTY

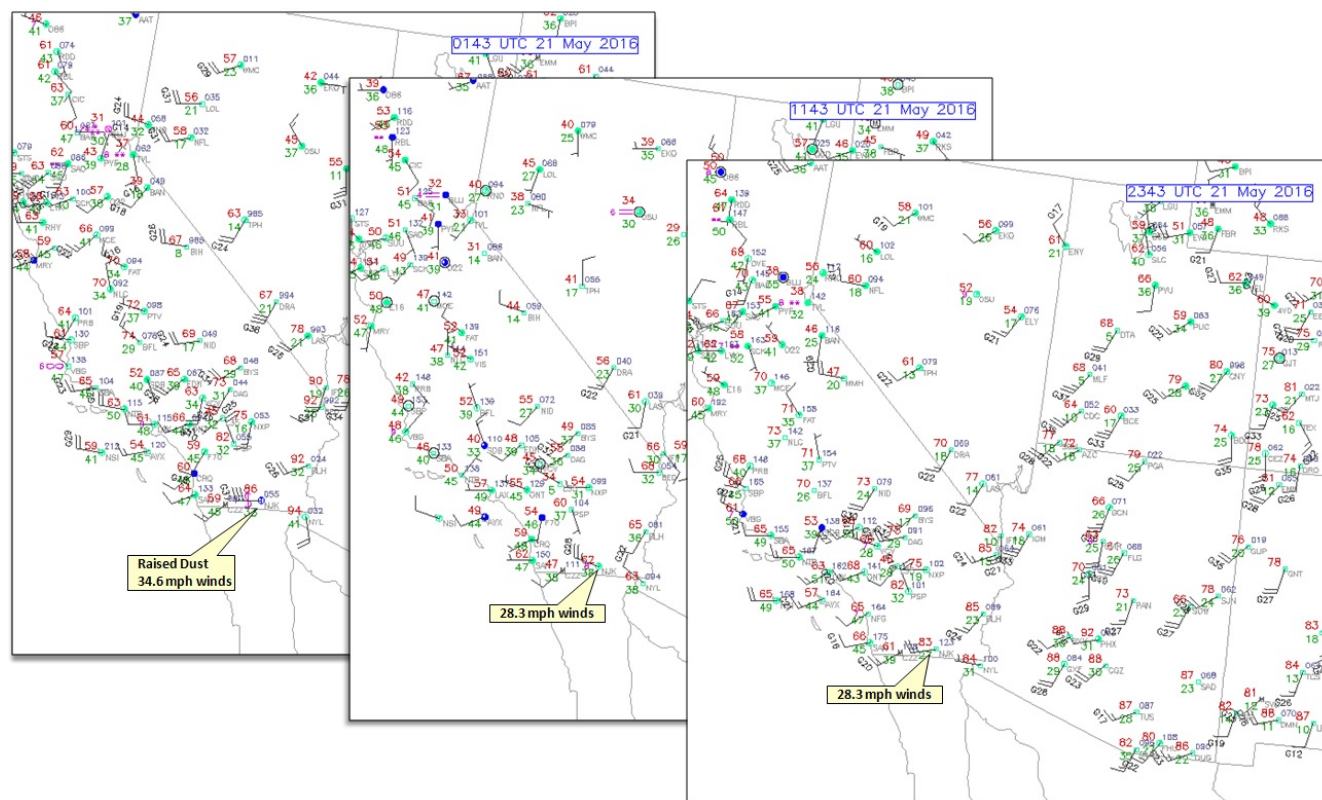


Fig 5-2: A trio of Surface Wind Maps with wind barbs depicting wind direction and speed across southeast California. The wind barb in the left-most image (1843 PST May 20/0143 UTC May 21) shows winds at El Centro NAF (KNJK) were at least 34.6 mph. The maroon symbol indicates raised dust at the airfield. The middle image (0343 PST May 21) shows a wind barb at KNJK that depict winds of at least 28.3 mph. This period corresponds to when winds and PM10 concentrations were elevated at all stations. The bottom image (1543 PST May 21) is just prior to the late afternoon surge leading up to Brawley's peak hourly PM₁₀ concentration of 653 $\mu\text{g}/\text{m}^3$ at 2000. Source: <http://weather.rap.ucar.edu/satellite>

Figures 5-3 through 5-6 help provide additional information regarding the entrained dust emissions into Imperial County by the gusty winds on Friday, May 20, 2016. While difficult to see the dust NOAA's Smoke Text Product identified plumes of dust over southeast California (**Appendix A**). Observations by NOAA identified a moderately dense plume of blowing dust was over the northern portion of Imperial County moving east toward Arizona. This observation was effective through 1900 PST May 20, 2016 and 0300Z May 21, 2016.

FIGURE 5-3
TERRA MODIS CAPTURES LIGHT BLOWING DUST OVER IMPERIAL COUNTY MAY 20, 2016



Fig 5-3: The MODIS instrument onboard the Terra satellite captured entrained dust in Imperial County at ~10:30 PST on May 20, 2016. Source: MODIS Today.

FIGURE 5-4
AQUA MODIS CAPTURES LIGHT BLOWING DUST OVER IMPERIAL COUNTY MAY 20, 2016



Fig 5-4: The MODIS instrument onboard the Aqua satellite captures entrained dust in Imperial County at ~13:30 PST on May 20, 2016. Source: MODIS Today

Figure 5-6 and Figure 5-7 shows the Aerosol Optical Depth over Imperial County captured by the MODIS instrument onboard the Terra and Aqua satellites on Saturday, May 21, 2016.¹¹ These images utilize the Deep Blue Aerosol Angstrom Exponent to measure AOD.¹² This is useful in

¹¹ Aerosol Optical Depth (AOD) (or Aerosol Optical Thickness) indicates the level at which particles in the air (aerosols) prevent light from traveling through the atmosphere. Aerosols scatter and absorb incoming sunlight, which reduces visibility. From an observer on the ground, an AOD of less than 0.1 is “clean” - characteristic of clear blue sky, bright sun and maximum visibility. As AOD increases to 0.5, 1.0, and greater than 3.0, aerosols become so dense that sun is obscured. Sources of aerosols include pollution from factories, smoke from fires, dust from dust storms, sea salt, and volcanic ash and smog. Aerosols compromise human health when inhaled by people, particularly those with asthma or other respiratory illnesses. Source: <https://worldview.earthdata.nasa.gov>

¹² The MODIS Deep Blue Aerosol Ångström Exponent layer can be used to provide additional information related to the aerosol particle size over land. This layer is created from the Deep Blue (DB) algorithm, originally developed for retrieving over desert/arid land (bright in the visible wavelengths). The Ångström exponent provides additional information on the particle size (larger the exponent, the smaller the particle size). Values < 1 suggest optical dominance of coarse particles (e.g. dust) and values > 1 suggest optical dominance of fine particles (e.g. smoke) <https://worldview.earthdata.nasa.gov>; The Ångström Exponent (denoted as AE or α) is a measure of how the AOD changes relative to the various wavelength of light (known as 'spectral dependence'). This is related to the aerosol particle size. Roughly speaking, values less than 1 suggest an optical dominance of coarse particles (e.g. dust, ash, sea spray), while values greater than one 1 dominance of fine particles (e.g. smoke, industrial pollution); <https://deepblue.gsfc.nasa.gov/science>

showing heavier aerosols that indicate dust. As seen from the images, there was a heavy layer of relatively thick aerosol particles over the area on May 21, 2016.

FIGURE 5-5
TERRA MODIS — IMPERIAL COUNTY MAY 21, 2016

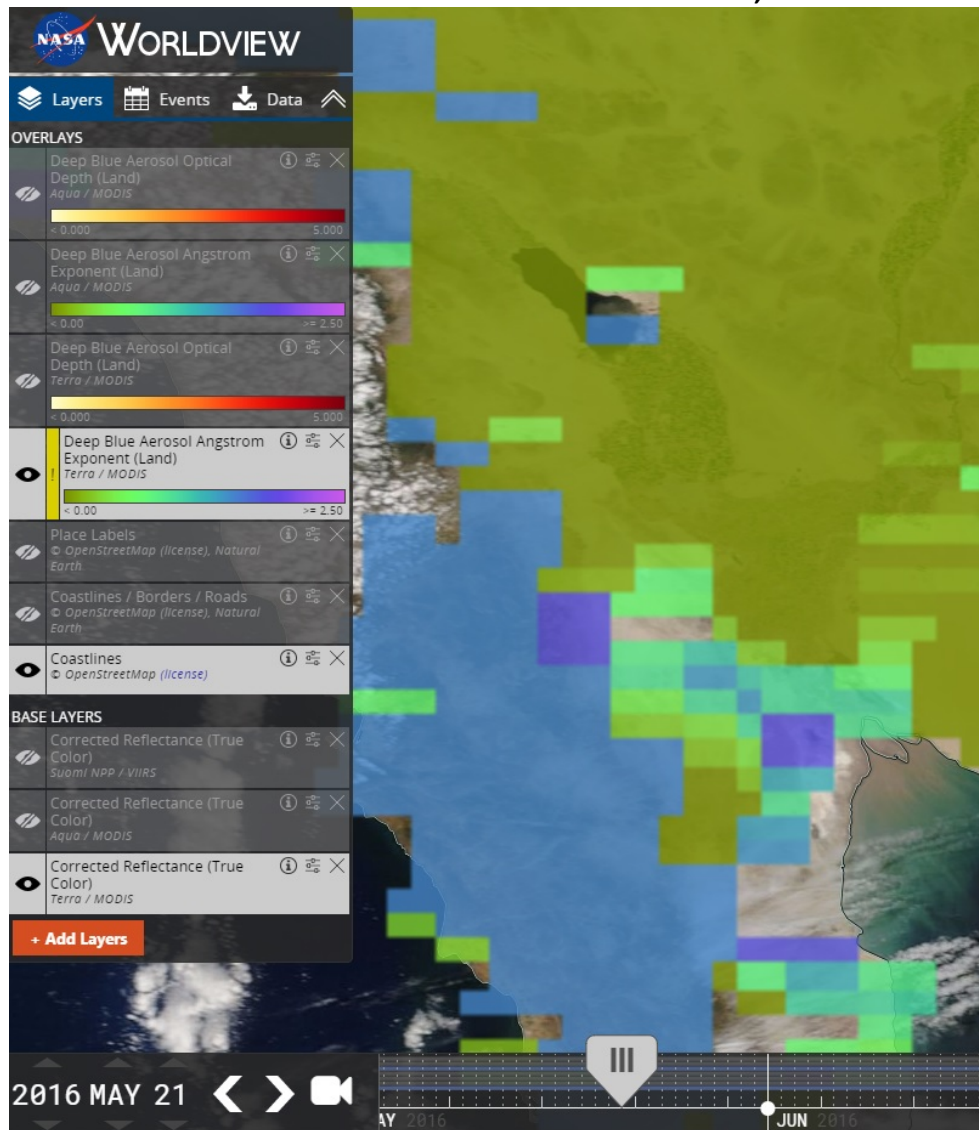


Fig 5-5: The Deep Blue Angstrom Exponent is used to discriminate the particle sizes of aerosols. The MODIS instrument onboard the Terra satellite captured this image showing dust-sized particles drifting over Imperial County at ~10:30 PST on May 21, 2016. Green colors indicate thicker aerosols that are more likely dust. Source: NASA Worldview; <https://worldview.earthdata.nasa.gov>

FIGURE 5-6
AQUA MODIS — IMPERIAL COUNTY MAY 21, 2016

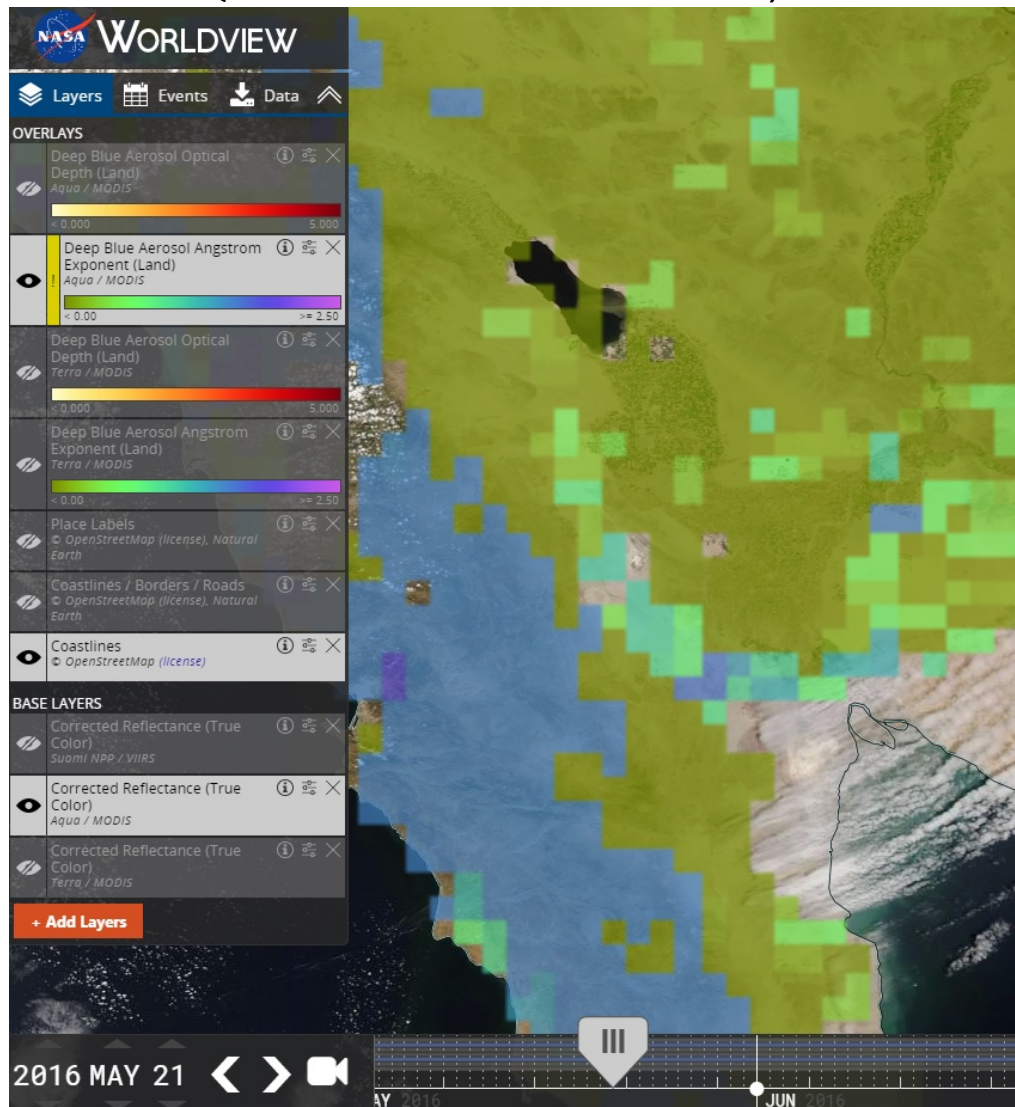


Fig 5-6: The Deep Blue Angstrom Exponent is used to discriminate the particle sizes of aerosols. The MODIS instrument onboard the Aqua satellite captured this image showing dust-sized particles drifting over Imperial County at ~13:30 PST on May 21, 2016. Green colors indicate thicker aerosols that are more likely dust. Source: NASA Worldview; <https://worldview.earthdata.nasa.gov>

The EPA accepts a high wind threshold for sustained winds of 25 mph in California and 12 other states.¹³ **Tables 5-1 through 5-7** provide a temporal relationship of wind speeds, wind direction, wind gusts (if available), and PM₁₀ concentrations at the exceeding stations on May 20 and May 21. The tables show that peak hourly concentrations took place immediately following or during

¹³ "Treatment of Data Influenced by Exceptional Events; Final Guidance", FR Vol. 81, No. 191, 68279, October 3, 2016

the period of high upstream wind speeds. The Brawley station does not have its own meteorological instruments, as does Calexico, Niland, and Westmorland.

TABLE 5-1
WIND SPEEDS & BRAWLEY PM₁₀ CONCENTRATIONS MAY 20, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				BRAWLEY FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0056	18	280	31	0053	13	280		0050	28	218	42	026	9	195	16	0000	16
0156	26	270		0153	15	280		0150	35	210	45	126	7	204	15	0100	10
0256	16	240		0253	14	240		0250	32	209	45	226	9	207	16	0200	16
0356	14	250		0353	11	280		0350	27	206	42	326	13	200	19	0300	48
0456	6	170		0453	5	190		0450	21	211	34	426	16	199	22	0400	38
0556	6	190		0553	0	0		0550	36	208	53	526	16	203	25	0500	75
0656	7	240		0653	3	100		0650	36	207	55	626	9	175	20	0600	109
0756	15	240		0753	3	VR		0750	32	209	51	726	8	191	15	0700	181
0856	13	220		0853	6	190		0850	28	208	44	826	8	192	14	0800	76
0956	22	260		0953	3	240		0950	22	199	44	926	2	338	14	0900	69
1056	20	260	28	1053	11	270	18	1050	27	206	40	1026	7	195	14	1000	55
1156	25	260	32	1153	10	240		1150	23	209	45	1126	5	239	12	1100	43
1256	26	270	34	1253	20	260	29	1250	27	212	47	1226	11	248	27	1200	84
1356	28	270	33	1353	22	280	30	1350	34	199	50	1326	20	220	40	1300	174
1456	24	280	31	1453	18	290	30	1450	34	214	50	1426	18	219	33	1400	134
1556	30	270	41	1553	20	290	26	1550	32	219	48	1526	18	204	37	1500	564
1656	32	280	43	1653	25	280	36	1650	30	221	45	1626	25	201	35	1600	995
1756	31	280	40	1753	21	290	31	1750	26	218	41	1726	24	201	36	1700	
1856	34	280	41	1851	26	280	40	1850	27	212	40	1826	17	180	35	1800	
1954	34	280	45	1905	25	270	38	1950	35	206	48	1926	21	221	32	1900	995
2056	43	270	49	2053	17	320	29	2050	30	218	44	2026	19	196	35	2000	
2106	40	270	51	2148	21	300	31	2150	26	210	43	2126	14	184	31	2100	
2256	41	270	49	2219	25	290	31	2250	27	218	38	2226	18	188	34	2200	995
2334	39	270	47	2345	14	330	31	2350	26	220	41	2326	10	128	34	2300	995

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains (FHCC1) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind speeds = mph; Direction = degrees

TABLE 5-2
WIND SPEEDS & CALEXICO PM₁₀ CONCENTRATIONS – MAY 20, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				CALEXICO				CALEXICO FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0056	18	280	31	0053	13	280		0050	28	218	42	0000	5.2	326		0000	15
0156	26	270		0153	15	280		0150	35	210	45	0100	6.7	310		0100	23
0256	16	240		0253	14	240		0250	32	209	45	0200	7.0	308		0200	26
0356	14	250		0353	11	280		0350	27	206	42	0300	3.7	278		0300	17
0456	6	170		0453	5	190		0450	21	211	34	0400	1.4	152		0400	20
0556	6	190		0553	0	0		0550	36	208	53	0500	4.3	112		0500	70
0656	7	240		0653	3	100		0650	36	207	55	0600	5.9	113		0600	44
0756	15	240		0753	3	VR		0750	32	209	51	0700	3.9	100		0700	50
0856	13	220		0853	6	190		0850	28	208	44	0800	1.7	61		0800	42
0956	22	260		0953	3	240		0950	22	199	44	0900	1.6	45		0900	37
1056	20	260	28	1053	11	270	18	1050	27	206	40	1000	4.3	10		1000	28
1156	25	260	32	1153	10	240		1150	23	209	45	1100	4.0	18		1100	29
1256	26	270	34	1253	20	260	29	1250	27	212	47	1200	3.3	16		1200	27
1356	28	270	33	1353	22	280	30	1350	34	199	50	1300	5.9	316		1300	36
1456	24	280	31	1453	18	290	30	1450	34	214	50	1400	12.7	302		1400	97
1556	30	270	41	1553	20	290	26	1550	32	219	48	1500	15.0	307		1500	126
1656	32	280	43	1653	25	280	36	1650	30	221	45	1600	15.0	309		1600	134
1756	31	280	40	1753	21	290	31	1750	26	218	41	1700	12.8	299		1700	132
1856	34	280	41	1851	26	280	40	1850	27	212	40	1800	10.6	292		1800	71
1954	34	280	45	1905	25	270	38	1950	35	206	48	1900	9.6	311		1900	233
2056	43	270	49	2053	17	320	29	2050	30	218	44	2000	10.5	331		2000	785
2106	40	270	51	2148	21	300	31	2150	26	210	43	2100	9.8	328		2100	985
2256	41	270	49	2219	25	290	31	2250	27	218	38	2200	10.8	325		2200	484
2334	39	270	47	2345	14	330	31	2350	26	220	41	2300	9.2	327		2300	320

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Calexico does not record gusts. Wind speeds = mph; Direction = degrees

TABLE 5-3
WIND SPEEDS & NILAND (ENGLISH RD) PM₁₀ CONCENTRATIONS MAY 20, 2016

NAVAL TEST BASE				BORREGO SPRINGS (BRGSD)				OCOTILLO WELLS (AS938)				NILAND (ENGLISH RD)				NILAND (ENGLISH RD) FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0000				0000	4	7	8	0040	17	310	26	0000	16	256		0000	19
0100				0100	10	318	17	0006	16	309	30	0100	20	260		0100	34
0200				0200	7	327	12	0201	11	307	19	0200	13	246		0200	15
0300				0300	4	259	9	0314	12	320	20	0300	11	179		0300	37
0400				0400	4	81	6	0424	18	313	31	0400	8	162		0400	33
0500				0500	16	343	25	0534	19	302	33	0500	4	218		0500	73
0600				0600	12	342	19	0646	20	315	32	0600	10	253		0600	43
0700				0700	1	17	4	0731	20	320	36	0700	16	260		0700	87
0800				0800	6	100	10	0821	20	317	31	0800	10	234		0800	50
0900				0900	6	97	11	0901	18	323	30	0900	5	251		0900	48
1000				1000	7	38	13	1001	7	303	18	1000	4	237		1000	46
1100				1100	25	222	36	1101	16	323	28	1100	7	249		1100	76
1200				1200	25	222	36	1227	22	319	36	1200	14	214		1200	216
1300				1300	24	221	37	1323	22	326	34	1300	12	253		1300	246
1400				1400	22	234	32	1405	23	317	35	1400	19	280		1400	259
1500				1500	26	240	37	1541	20	329	31	1500	24	279		1500	744
1600	31	263		1600	27	240	37	1604	15	345	25	1600	25	280		1600	639
1700	29	261		1700	28	237	38	1701	12	355	29	1700	27	272		1700	732
1800	26	261		1800	21	234	30	1801	21	7	43	1800	30	269		1800	995
1900	26	265		1900	8	238	18	1913	24	327	43	1900	36	267		1900	995
2000	28	272		2000	15	238	27	2002	23	319	43	2000	37	268		2000	666
2100	29	264		2100	18	242	28	2105	24	310	38	2100	37	268		2100	995
2200	29	260		2200	19	245	27	2243	26	334	43	2200	32	272		2200	304
2300	28	254		2300	14	248	23	2311	23	316	41	2300	32	272		2300	76

*Wind data for the Naval Test Base is absent for some hours. Data is from the CARB AQMIS2 system. Wind data for Ocotillo Wells (AS938) and Borrego Springs (BRGSD) from the University of Utah's MesoWest system. Wind and air quality data for Niland is from the EPA's AQS data bank. Wind speeds = mph; Direction = degrees

TABLE 5-4
WIND SPEEDS & WESTMORLAND PM₁₀ CONCENTRATIONS – MAY 20, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				WESTMORLAND				WESTMORLAND FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0056	18	280	31	0053	13	280		0050	28	218	42	0000	5	279		0000	35
0156	26	270		0153	15	280		0150	35	210	45	0100	4	262		0100	63
0256	16	240		0253	14	240		0250	32	209	45	0200	3	225		0200	30
0356	14	250		0353	11	280		0350	27	206	42	0300	4	235		0300	18
0456	6	170		0453	5	190		0450	21	211	34	0400	4	250		0400	22
0556	6	190		0553	0	0		0550	36	208	53	0500	8	295		0500	107
0656	7	240		0653	3	100		0650	36	207	55	0600	12	278		0600	111
0756	15	240		0753	3	VR		0750	32	209	51	0700	6	279		0700	51
0856	13	220		0853	6	190		0850	28	208	44	0800	9	257		0800	244
0956	22	260		0953	3	240		0950	22	199	44	0900	9	252		0900	177
1056	20	260	28	1053	11	270	18	1050	27	206	40	1000	9	257		1000	140
1156	25	260	32	1153	10	240		1150	23	209	45	1100	12	239		1100	359
1256	26	270	34	1253	20	260	29	1250	27	212	47	1200	11	238		1200	290
1356	28	270	33	1353	22	280	30	1350	34	199	50	1300	11	240		1300	144
1456	24	280	31	1453	18	290	30	1450	34	214	50	1400	9	256		1400	237
1556	30	270	41	1553	20	290	26	1550	32	219	48	1500	14	268		1500	995
1656	32	280	43	1653	25	280	36	1650	30	221	45	1600	20	274		1600	995
1756	31	280	40	1753	21	290	31	1750	26	218	41	1700	21	275		1700	
1856	34	280	41	1851	26	280	40	1850	27	212	40	1800	22	278		1800	995
1954	34	280	45	1905	25	270	38	1950	35	206	48	1900	21	280		1900	775
2056	43	270	49	2053	17	320	29	2050	30	218	44	2000	16	291		2000	995
2106	40	270	51	2148	21	300	31	2150	26	210	43	2100	17	283		2100	995
2256	41	270	49	2219	25	290	31	2250	27	218	38	2200	20	280		2200	
2334	39	270	47	2345	14	330	31	2350	26	220	41	2300	14	290		2300	

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Wind and air quality data for Westmorland is from the EPA's AQS data bank. Westmorland does not record gusts. Wind speeds = mph; Direction = degrees

TABLE 5-5
WIND SPEEDS & BRAWLEY PM₁₀ CONCENTRATIONS MAY 21, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				MOUNTAIN SPRINGS GRADE (TNSC1)				FISH CREEK MOUNTAINS (FHCC1)				BRAWLEY FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0003	37	290	45	0008	31	290	41	050	21	219	44	026	16	244	34	0000	541
0114	39	270	51	0140	36	280	46	150	25	218	39	126	19	218	35	0100	569
0256	39	270	46	0253	18	330	25	250	27	207	39	226	15	249	32	0200	546
0307	28	290	43	0353	24	280	32	350	22	224	36	326	8	219	25	0300	315
0422	29	280	37	0430	23	280	32	450	20	225	34	426	6	208	22	0400	185
0504	23	280	30	0553	13	290	23	550	22	207	32	526	9	192	20	0500	130
0656	22	270		0653	18	280	25	650	26	205	35	626	7	236	26	0600	119
0756	21	280		0753	16	270	24	750	31	207	38	726	5	218	24	0700	95
0856	21	300		0853	17	280	23	850	28	217	44	826	12	247	26	0800	51
0956	21	280	28	0953	15	280	22	950	26	211	40	926	11	254	32	0900	75
1056	20	290	26	1053	17	290		1050	27	204	42	1026	7	317	25	1000	50
1156	20	270	28	1153	15	290	23	1150	24	221	40	1126	10	263	21	1100	58
1256	28	280		1253	22	290	28	1250	25	221	40	1226	10	261	23	1200	25
1356	28	280	34	1353	20	280	25	1350	21	229	33	1326	15	305	32	1300	34
1456	30	260		1453	28	280	33	1450	20	234	32	1426	16	266	37	1400	25
1556	29	270		1553	20	270	31	1550	24	237	39	1526	16	257	29	1500	75
1656	30	270	39	1653	22	260	33	1650	27	232	38	1626	17	245	33	1600	138
1756	24	270	34	1753	21	270	29	1750	32	221	45	1726	21	263	39	1700	232
1856	26	270	33	1853	16	280		1850	33	220	50	1826	13	236	35	1800	255
1956	26	280		1953	17	280		1950	36	216	49	1926	22	256	39	1900	352
2056	24	280		2053	21	300	28	2050	32	212	49	2026	21	223	36	2000	653
2156	15	270		2153	14	280		2150	38	207	51	2126	16	223	30	2100	99
2256	11	280		2253	10	270		2250	36	212	54	2226	14	225	19	2200	122
2356	14	280		2353	8	320		2350	37	209	54	2326	17	212	23	2300	33

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for the Fish Creek Mountains (FHCC1) and Mountain Springs Grade (TNSC1) from the University of Utah's MesoWest system. Brawley station does not record wind data. Wind speeds = mph; Direction = degrees

TABLE 5-6
WIND SPEEDS & CALEXICO PM₁₀ CONCENTRATIONS MAY 21, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				CALEXICO				CALEXICO FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0003	37	290	45	0008	31	290	41	0000	33	249	52	0000	12.9	317		0000	985
0114	39	270	51	0140	36	280	46	0100	35	245	52	0100	13.7	314		0100	985
0256	39	270	46	0253	18	330	25	0200	29	247	48	0200	14.5	311		0200	985
0307	28	290	43	0353	24	280	32	0300	24	254	42	0300	13.5	315		0300	498
0422	29	280	37	0430	23	280	32	0400	23	256	42	0400	13.1	317		0400	283
0504	23	280	30	0553	13	290	23	0500	24	254	42	0500	13.3	312		0500	312
0656	22	270		0653	18	280	25	0600	13	253	26	0600	12.1	311		0600	61
0756	21	280		0753	16	270	24	0700	13	253	21	0700	12.9	308		0700	96
0856	21	300		0853	17	280	23	0800	4	1	9	0800	12.7	315		0800	41
0956	21	280	28	0953	15	280	22	0900	7	267	15	0900	11.2	317		0900	29
1056	20	290	26	1053	17	290		1000	4	224	9	1000	9.3	315		1000	25
1156	20	270	28	1153	15	290	23	1100	9	262	16	1100	8.4	315		1100	22
1256	28	280		1253	22	290	28	1200	9	258	21	1200	10.6	306		1200	27
1356	28	280	34	1353	20	280	25	1300	10	269	17	1300	12.7	316		1300	64
1456	30	260		1453	28	280	33	1400	13	267	21	1400	14.5	309		1400	122
1556	29	270		1553	20	270	31	1500	14	265	27	1500	16.3	299		1500	248
1656	30	270	39	1653	22	260	33	1600	17	279	27	1600	15.4	300		1600	158
1756	24	270	34	1753	21	270	29	1700	12	279	24	1700	13.6	299		1700	116
1856	26	270	33	1853	16	280		1800	14	274	28	1800	11.0	313		1800	54
1956	26	280		1953	17	280		1900	12	307	21	1900	14.7	305		1900	80
2056	24	280		2053	21	300	28	2000	12	269	21	2000	13.1	310		2000	66
2156	15	270		2153	14	280		2100	12	260	23	2100	12.2	312		2100	41
2256	11	280		2253	10	270		2200	14	239	20	2200	12.8	304		2200	55
2356	14	280		2353	8	320		2300	13	261	23	2300	12.4	305		2300	80

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise-Ocotillo (IMPSD) from the University of Utah's MesoWest system. Calexico does not record gusts. Wind speeds = mph; Direction = degrees

TABLE 5-7
WIND SPEEDS & EL CENTRO PM₁₀ CONCENTRATIONS MAY 21, 2016

EL CENTRO NAF (KNJK)				IMPERIAL CO AIRPORT (KIPL)				SUNRISE-OCOTILLO (IMPSD)				EL CENTRO				EL CENTRO FEM	
HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	W/S	W/D	W/G	HOUR	PM ₁₀ (µg/m ³)
0003	37	290	45	0008	31	290	41	0020	33	249	52	0000	18	291		0000	995
0114	39	270	51	0140	36	280	46	0120	35	245	52	0100	20	288		0100	995
0256	39	270	46	0253	18	330	25	0210	29	247	48	0200	21	286		0200	660
0307	28	290	43	0353	24	280	32	0300	24	254	42	0300	16	295		0300	848
0422	29	280	37	0430	23	280	32	0400	23	256	42	0400	17	285		0400	937
0504	23	280	30	0553	13	290	23	0520	24	254	42	0500	15	281		0500	191
0656	22	270		0653	18	280	25	0600	13	253	26	0600	11	284		0600	55
0756	21	280		0753	16	270	24	0700	13	253	21	0700	13	279		0700	44
0856	21	300		0853	17	280	23	0800	4	1	9	0800	13	287		0800	69
0956	21	280	28	0953	15	280	22	0900	7	267	15	0900	11	288		0900	67
1056	20	290	26	1053	17	290		1000	4	224	9	1000	11	286		1000	72
1156	20	270	28	1153	15	290	23	1100	9	262	16	1100	11	287		1100	59
1256	28	280		1253	22	290	28	1200	9	258	21	1200	14	277		1200	77
1356	28	280	34	1353	20	280	25	1300	10	269	17	1300	14	284		1300	66
1456	30	260		1453	28	280	33	1400	13	267	21	1400	16	283		1400	123
1556	29	270		1553	20	270	31	1500	14	265	27	1500	16	279		1500	117
1656	30	270	39	1653	22	260	33	1600	17	279	27	1600	18	284		1600	164
1756	24	270	34	1753	21	270	29	1700	12	279	24	1700	15	274		1700	83
1856	26	270	33	1853	16	280		1800	14	274	28	1800	15	284		1800	95
1956	26	280		1953	17	280		1900	12	307	21	1900	14	281		1900	119
2056	24	280		2053	21	300	28	2000	12	269	21	2000	14	286		2000	150
2156	15	270		2153	14	280		2100	12	260	23	2100	9	291		2100	24
2256	11	280		2253	10	270		2200	14	239	20	2200	10	277		2200	32
2356	14	280		2353	8	320		2300	13	261	23	2300	11	281		2300	22

*Wind data for KIPL and KNJK from the NCEI's QCLCD system. Wind data for Sunrise-Ocotillo (IMPSD) from the University of Utah's MesoWest system. El Centro does not record gusts. Wind speeds = mph; Direction = degrees

Figure 5-7 is a graphic depiction of the exceedance timeline on May 20, 2016 that combines the HYSPLIT trajectory, upstream wind speeds, and important peak concentration times leading up to the exceedances at Brawley, Calexico, Niland, and Westmorland. El Centro did not exceed on May 20, 2016 because of a power outage during the critical hours of 2000 to 2300. As explained in the Conceptual Model section all the trajectories end during the hour of peak concentrations or an hour just before.

FIGURE 5-7
ENTRAINMENT TIMELINE MAY 20, 2016

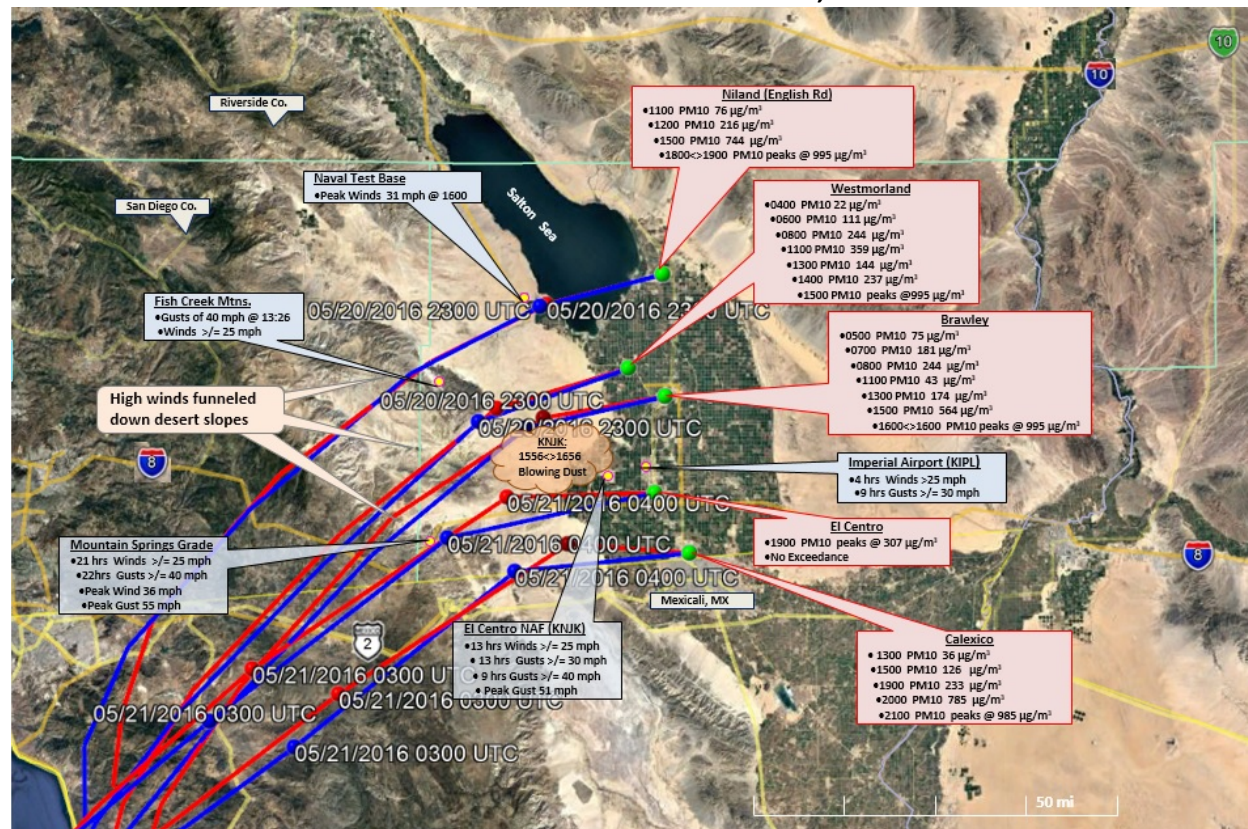


Fig 5-7: High winds at upstream sites helped entrain dust on the western edge of the Sonoran Desert west of the Imperial County monitoring stations. The 6-hour HYSPLIT back-trajectory ends at 1600 PST at Brawley, Niland, and Westmorland. The back-trajectory for Calexico and El Centro ends at 2100 PST. Air quality data is from the EPA's AQS data bank. See individual wind site graphs in **Appendix B** for data source. Red trajectory depicts airflow at the 10m level; blue is 100m. Generated through NOAA's Air Resources Laboratory. Google Earth base map

Figure 5-8 depicts the key factors related to the exceedances at Brawley, Calexico, and El Centro on May 21. High winds continued from May 20 through May 21 almost without let up, although the wind direction shifted to a more due west-northwesterly track. A Wind Advisory and Blowing Dust Advisory were still in effect for Imperial County on May 21, although the advisory for blowing dust ended at 0200. So much dust had been entrained on May 20 that by 0000 PST both Calexico and El Centro monitors measured peak hourly concentrations. Brawley also measured high concentrations early in the morning, but did not hit peak concentrations until 2000 (as did Niland which did not exceed). The six-hour back-trajectory for Calexico and El Centro ends at 0000 on May 21. The 20-hour back-trajectory ends at Brawley, Westmorland, and Niland at 2000 PST on May 21.

FIGURE 5-8
ENTRAINMENT TIMELINE MAY 21, 2016

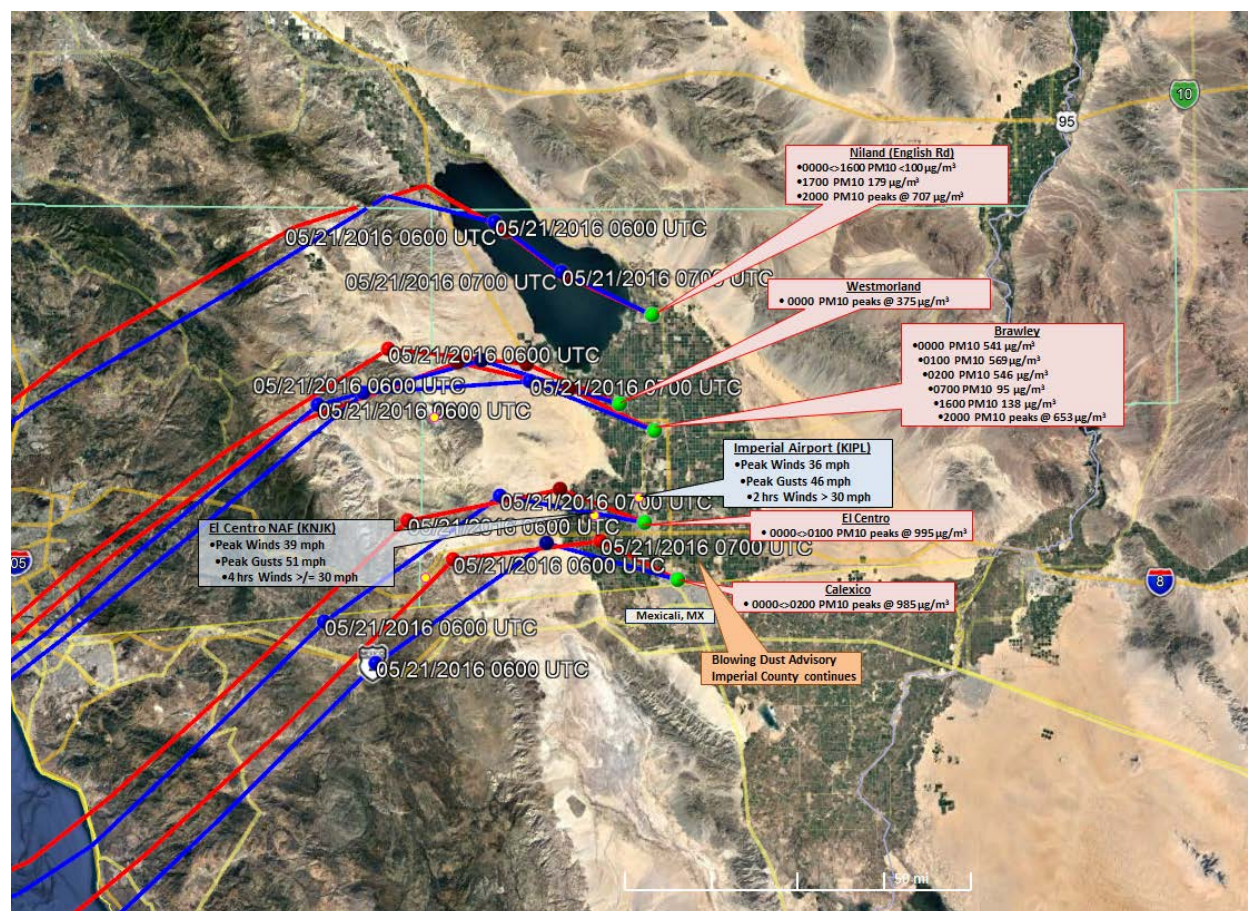


Fig 5-8: Winds remained gusty on May 21, 2016 as winds shifted west-northwesterly as depicted in the HYSPLIT back-trajectories. Air quality data is from the EPA's AQS data bank. See individual wind site graphs in **Appendix B** for data source. The 6-hour HYSPLIT back-trajectory for El Centro and Calexico ends at 0000 PST May 21, 2016. The 20-hour back-trajectory for Brawley ends at 2000 PST May 21, 2016. Red trajectory depicts airflow at the 10m level; blue is 100m. Generated through NOAA's Air Resources Laboratory. Google Earth base map

Figures 5-9 through 5-13 depict PM₁₀ concentrations and wind speeds over a 96-hour period at Brawley, Calexico, El Centro, Niland, and Westmorland. Fluctuations in hourly concentrations at the monitors over 96 hours show a positive correlation with wind speeds and gusts at upstream sites.

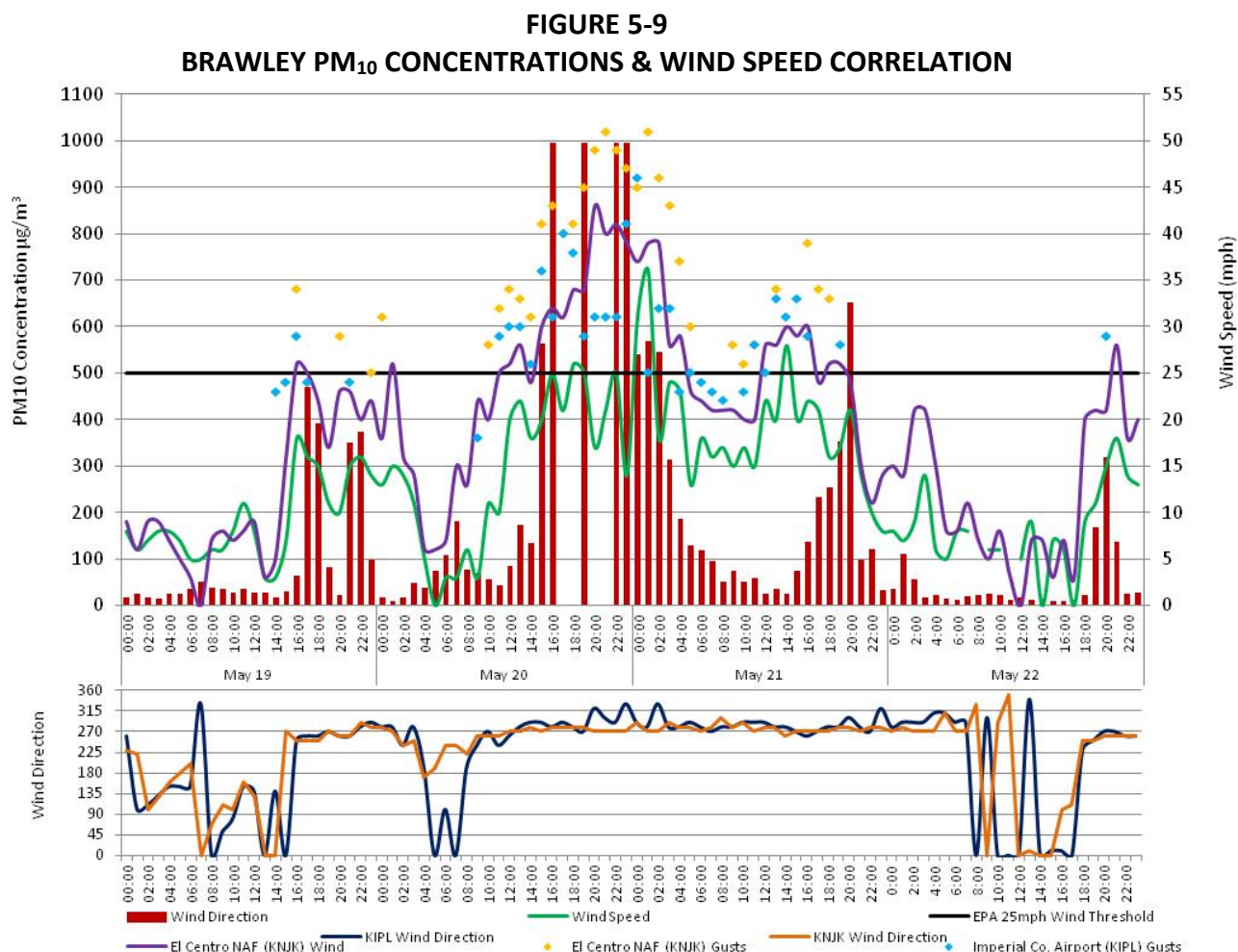


Fig 5-9: Fluctuations in hourly concentrations over 96 hours show a positive correlation with wind speeds, and particularly gusts, at Imperial County Airport (KIPL) and El Centro NAF (KNJKL). Brawley station does not measure wind. Black line indicates 25 mph threshold. Air quality data from the EPA's AQS data bank. Wind data from the NCEI's QCLCD system

FIGURE 5-10
CALEXICO PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

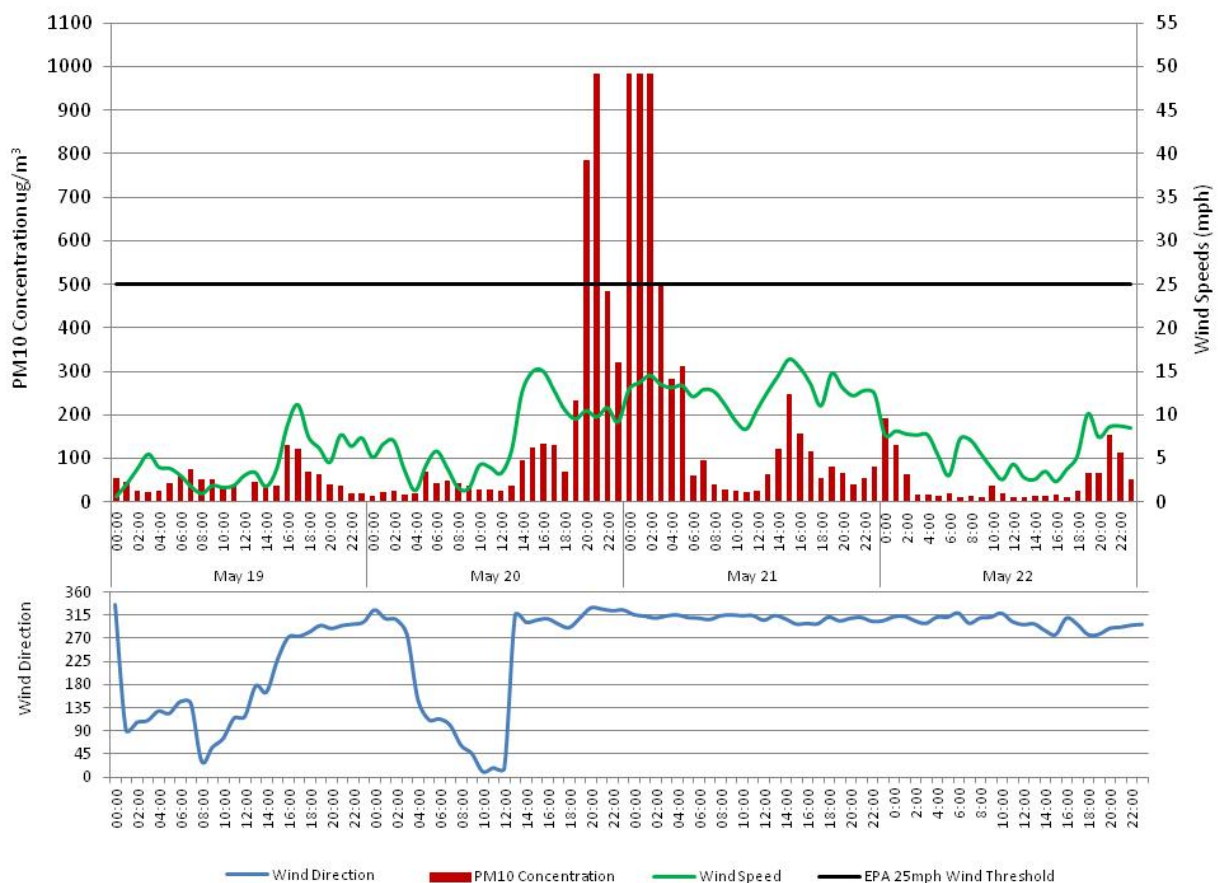


Fig 5-10: Winds at Calexico did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

FIGURE 5-11
EL CENTRO PM₁₀ CONCENTRATIONS & WIND SPEED CORRELATION

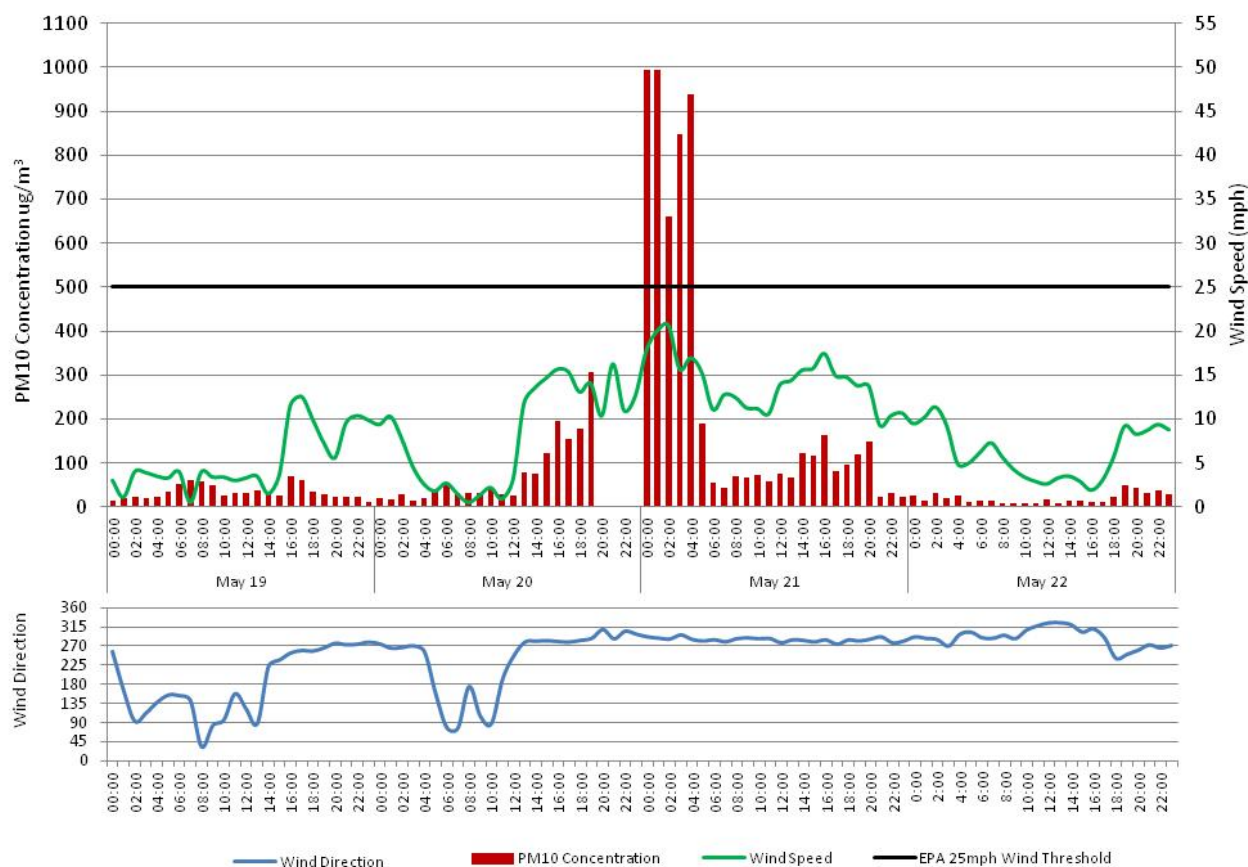


Fig 5-11: Winds at El Centro did not reach the 25 mph threshold. However, the monitor might have exceeded if not for a power failure during four critical hours. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

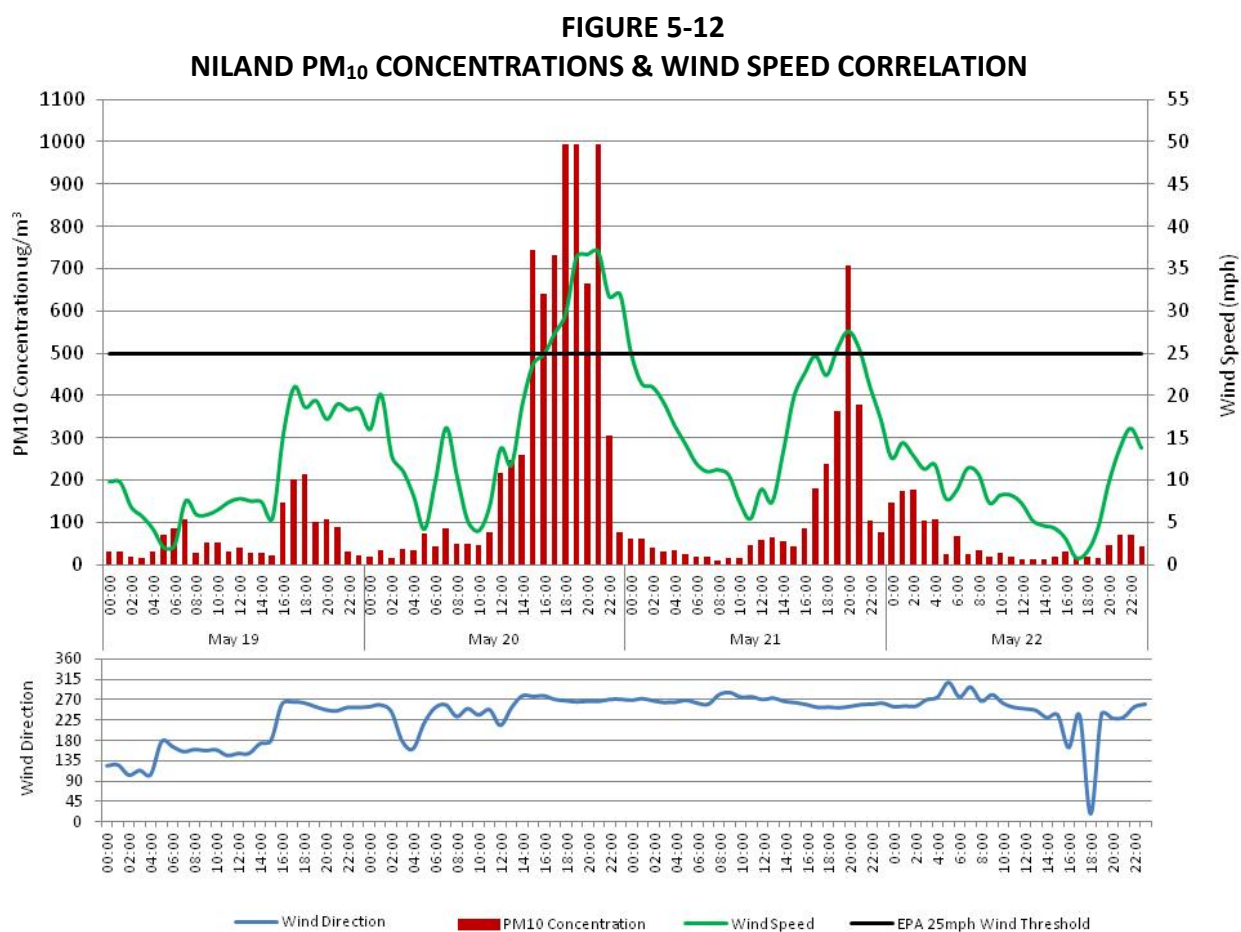


Fig 5-12: Winds at Niland surpassed the 25 mph wind threshold. An increase in wind speeds shows a positive correlation with increased hourly concentrations. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

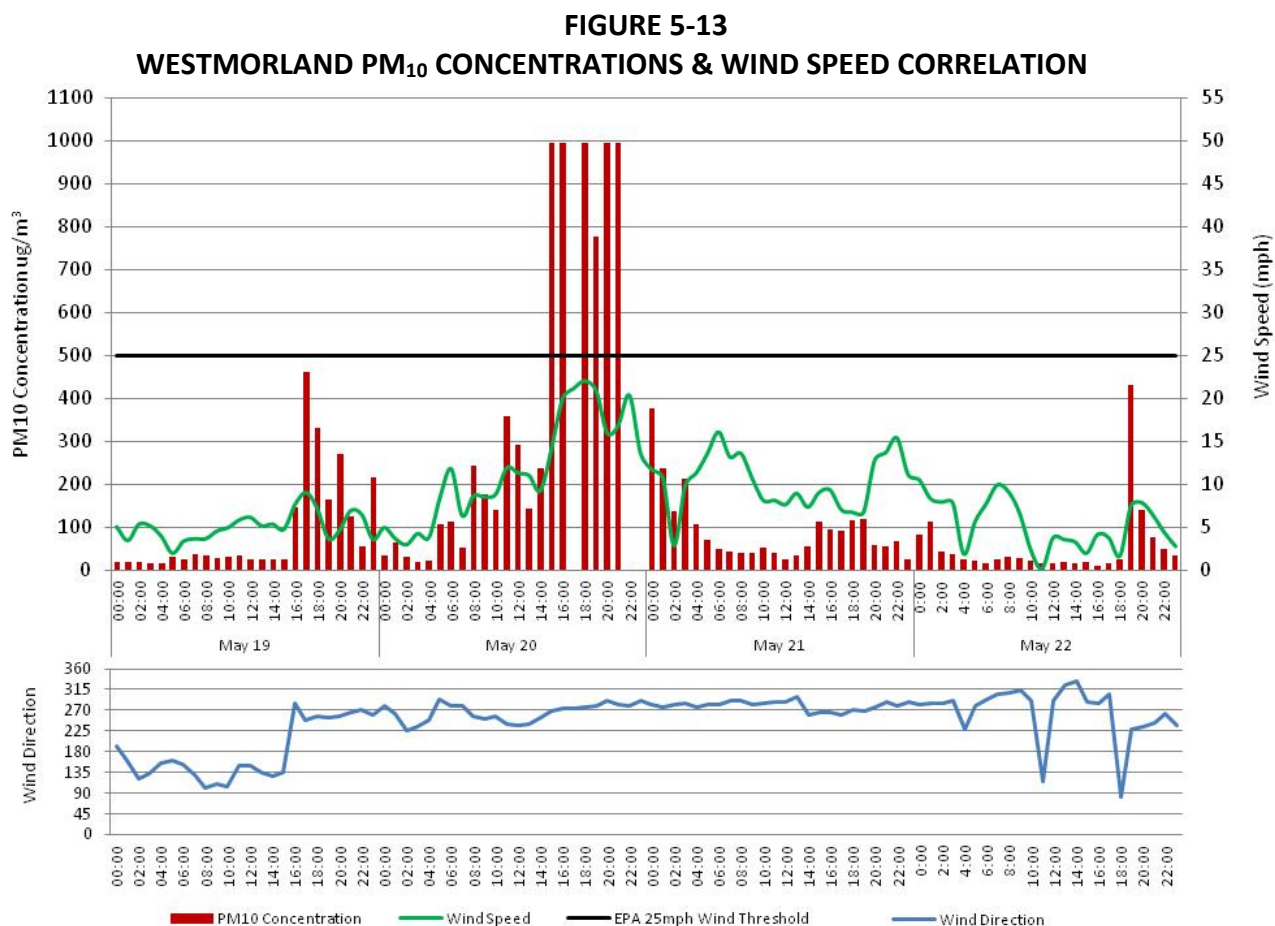


Fig 5-13: Winds at Westmorland did not reach the 25 mph threshold. However, the lesser wind speeds allowed for greater deposition of dust on the monitor. Black line indicates 25 mph threshold. Air quality and wind data from the EPA's AQS data bank

Figure 5-14 depicts the relationship between the 96-hour PM₁₀ fluctuations by the Brawley, Calexico, El Centro, Niland, and Westmorland monitors together with upstream wind speeds. A positive correlation between an increase in wind speeds and gusts with increased concentrations at the monitors. **Appendix C** contains additional graphs illustrating the relationship between PM₁₀ concentrations and wind speeds from region monitoring sites within Imperial County, eastern Riverside County, and Yuma, Arizona during the wind event.

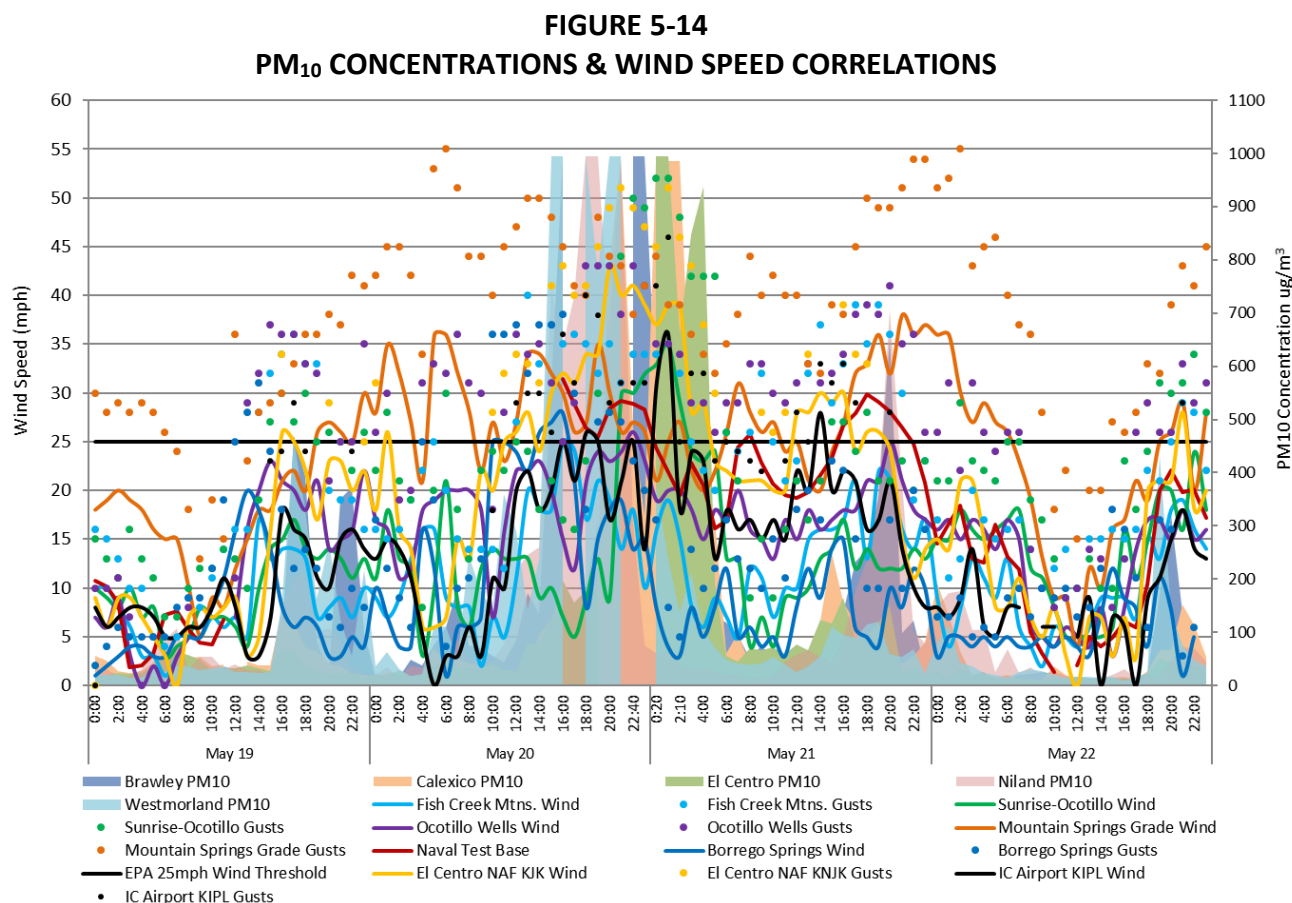


Fig 5-14: This graph depicts the 96-hour PM₁₀ fluctuations by the Brawley, Calexico, El Centro, Niland, and Westmorland monitors together with upstream wind speeds. A positive correlation between increases in wind speeds and gusts is evident. Black line indicates the 25 mph threshold

FIGURE 5-15
UPSTREAM WIND SPEEDS

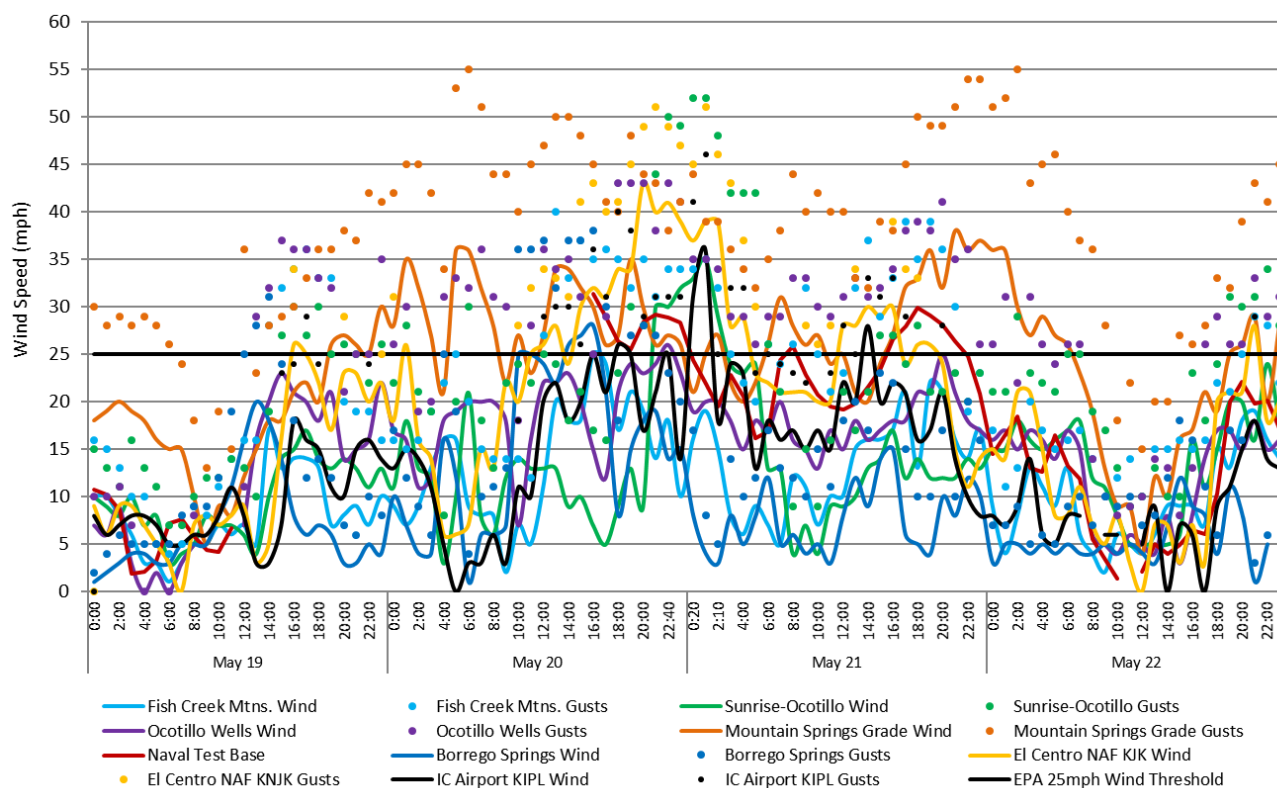


Fig 5-15: This graph depicts the 96-hour upstream wind speeds. A positive correlation between an increase in wind speeds can be seen, particularly with gusts. Black line indicates the 25 mph threshold

Figure 5-16 compares the 96-hour concentrations at Brawley, Calexico, El Centro, Westmorland, and Niland with visibility¹⁴ at local airfields between May 20, 2016 and May 21, 2016. Generally, drops in visibility correspond to highest hourly concentrations at the monitors.

¹⁴ According to the NWS there is a difference between human visibility and the visibility measured by an Automated Surface Observing System (ASOS) or an Automated Weather Observing System (AWOS). The automated sensors measure clarity of the air vs. how far one can “see”. The more moisture, dust, snow, rain, or particles in the light beam the more light scattered. The sensor measures the return every 30 seconds. The visibility value transmitted is the average 1-minute value from the past 10 minutes. The sensor samples only a small segment of the atmosphere, 0.75 feet therefore an algorithm is used to provide a representative visibility. Siting of the visibility sensor is critical and large areas should provide multiple sensors to provide a representative observation; <http://www.nws.noaa.gov/asos/vsby.htm>.

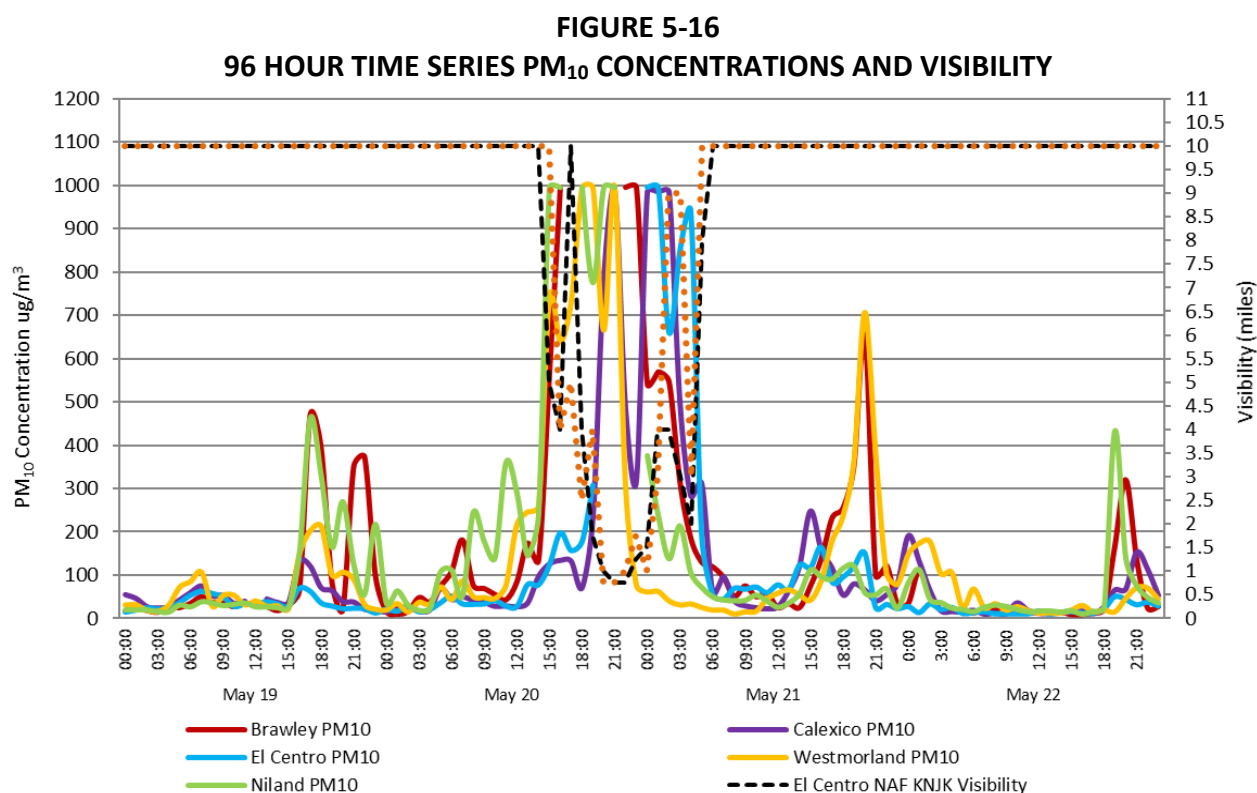


Fig 5-16: Visibility as reported from El Centro NAF (KNJK) and Imperial County Airport (KIPL) shows that visibility dipped significantly at KIPL prior to peak concentrations at Brawley, Westmorland, and Niland. Visibility data from the NCEI's QCLCD data bank

A Wind Advisory⁹ for a large portion of southeast California that included Imperial County was issued at 13:17 PST on May 19, 2016 in anticipation of the high winds that would be generated by the approaching weather system. Both the San Diego and Phoenix NWS offices forecasted southwest winds of 20 to 30 mph with gusts up to 40 mph or more. Wind speeds in Imperial County measured higher winds during the May 20, 2016 and May 21, 2016 wind event than forecasted. As early as May 19, 2016 both the San Diego and Phoenix NWS offices began issuing a series of Urgent Weather messages containing wind advisories. Combined, these wind advisories advised of reduced visibility due to blowing dust for the mountain passes and deserts of San Diego County and Imperial County. As the system moved through the region blowing dust advisories advised of dense blowing dust impacting Imperial County. In total, the San Diego NWS office issued seven Urgent Weather messages with associated wind advisories and reduced visibility beginning on May 19, 2016 and expiring May 21, 2016. The Phoenix NWS office issued 10 Urgent Weather messages with associated wind advisories and reduced visibility beginning on May 19, 2016 and expiring late evening May 21, 2016.

On May 20, 2016 Brawley's AQI¹⁵ (**Fig. 5-17**) was in the "Yellow" or Moderate level (PM₁₀ 51-

¹⁵ The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours

100 μm^3) at 1:00 a.m. At 6 p.m. it entered the “Orange” or Unhealthy for Sensitive Groups category (PM_{10} 101-150 μm^3). Calexico’s AQI (**Fig. 5-18**) was in the “Green” or Good category (PM_{10} 0-50 μm^3) until it dropped into the “Yellow” or Moderate level at 9 p.m. El Centro’s AQI (**Fig. 5-19**) was in the “Green” or Good category until slipping into the “Yellow” range at 9 p.m. At 12 a.m. air quality had dropped into the “Orange” level. Niland’s AQI (**Fig. 5-20**) stood in the “Yellow” level until dropping into the “Orange” category at 7 p.m. At 10 p.m. air quality fell into the “Red” or Unhealthy level (PM_{10} 151-200 μm^3) where it remained to the end of the day. Westmorland’s AQI (**Fig. 5-21**) was in the “Yellow” range until 4 p.m. when it entered the “Orange” category. At 9 p.m. air quality fell even further into the “Red” category. At 10 p.m. an Air Quality Alert was issued for Westmorland notifying the public that air quality was Unhealthy. Air quality remained Unhealthy for the rest of the day. See **Appendix A** for Air Quality chart.

FIGURE 5-17
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
MAY 20, 2016

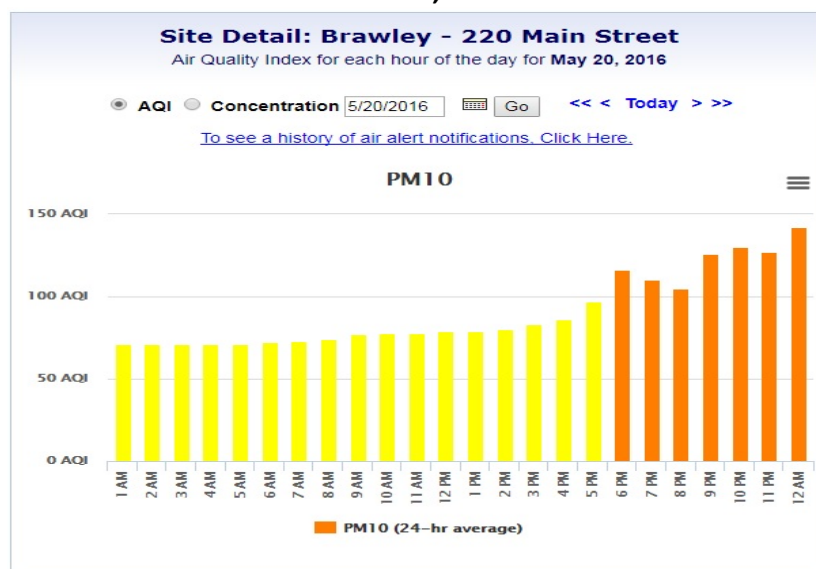


Fig 5-17: The reduced air quality in Brawley shows that the fugitive dust entrained by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: <https://www.airnow.gov/index.cfm?action=aqibasics.aqi>

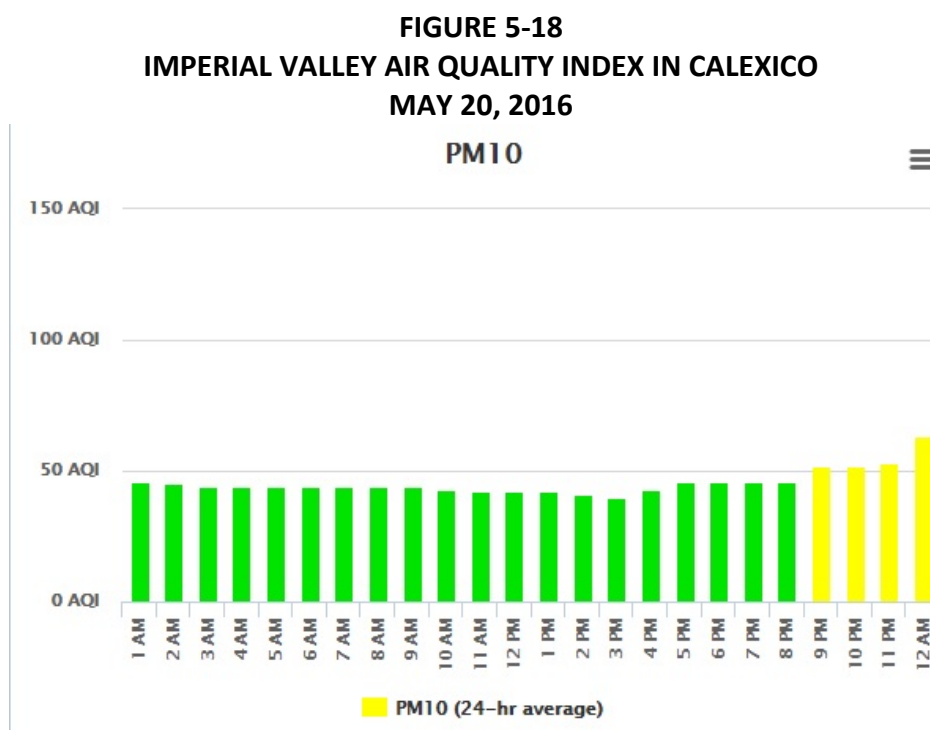


Fig 5-18: The reduced air quality in Calexico shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

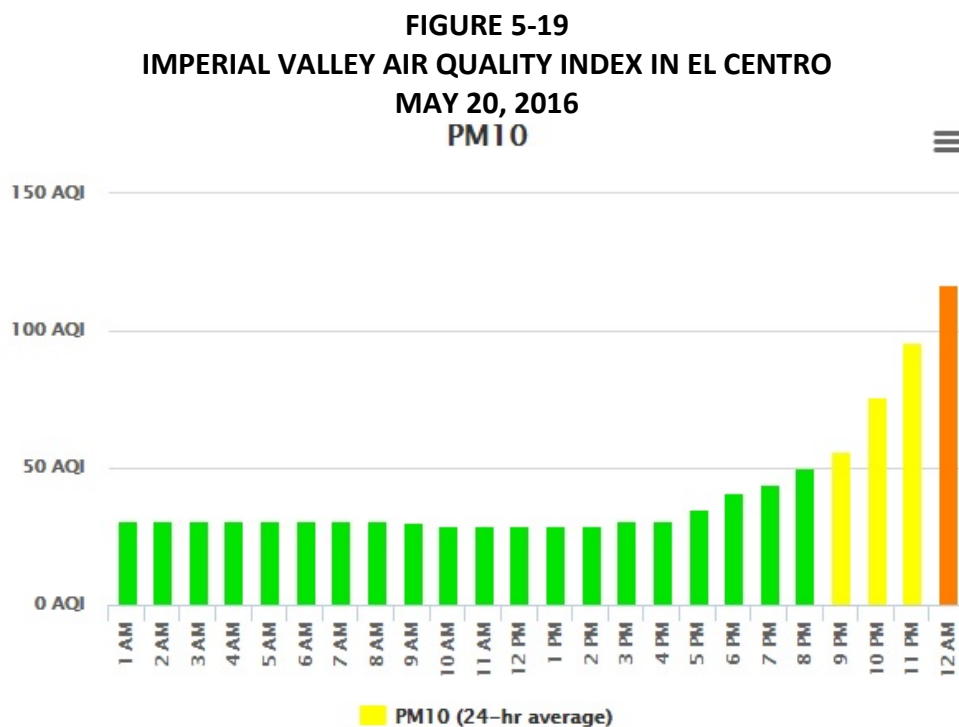


Fig 5-19: The reduced air quality in El Centro shows that the fugitive dust entrained by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-20
IMPERIAL VALLEY AIR QUALITY INDEX IN NILAND
MAY 20, 2016
PM10

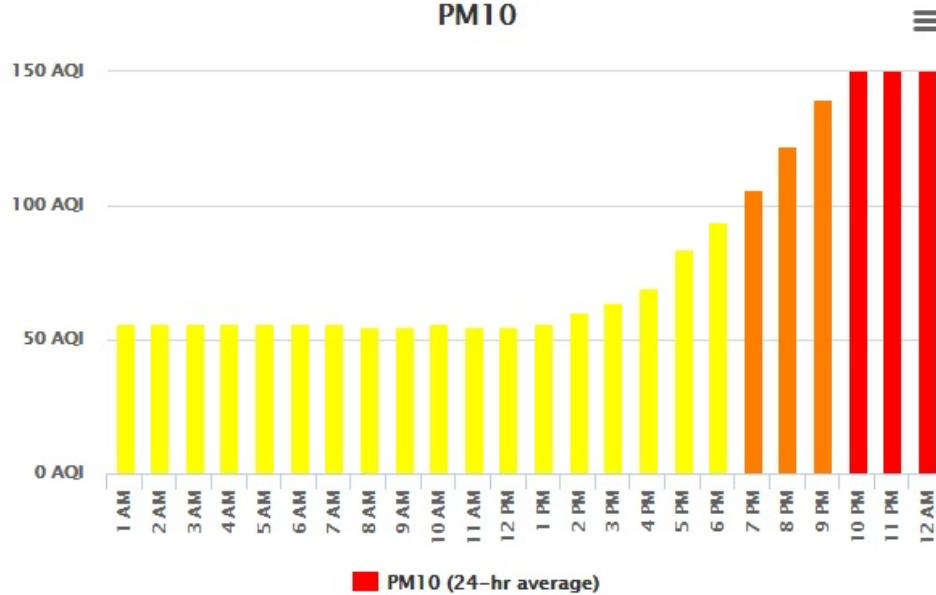


Fig 5-20: The reduced air quality in Niland (English Rd) shows that the fugitive dust entrained by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-21
IMPERIAL VALLEY AIR QUALITY INDEX IN WESTMORLAND
MAY 20, 2016
PM10

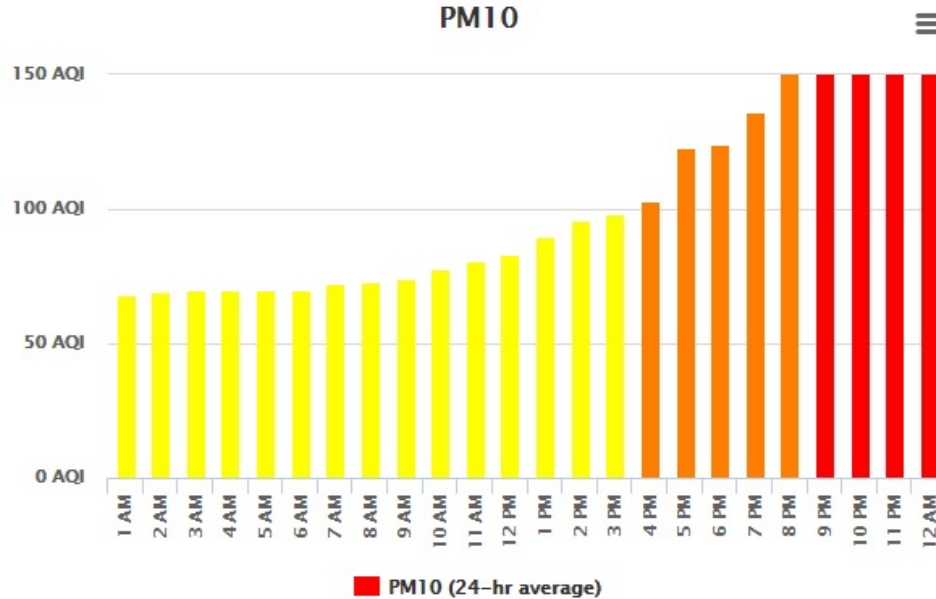


Fig 5-21: The reduced air quality in Westmorland shows that the fugitive dust entrained by high winds impacted the air quality of the Imperial Valley. Source: ICAPCD archives

On May 21, 2016, Brawley's AQI (**Fig. 5-22**) was already at the "Red" or Unhealthy level beginning at 1 a.m. At 4 a.m. air quality dropped into the "Purple" or Very Unhealthy level (PM₁₀ 201-300 μm^3) and remained there until rising to the Unhealthy level at 5 p.m. By 12 a.m. air quality had improved enough to be classified as Unhealthy for Sensitive Groups. Calexico's AQI (**Fig. 5-23**) began the day in the Moderate category before falling into the "Orange" level at 7 a.m. It remained there until rising back into the "Yellow" category at 10 p.m. El Centro's AQI (**Fig. 5-24**) began May 21 in the "Orange" category before dropping into the "Red" level at 2 a.m. At 5 a.m. air quality dropped even further into the "Purple" category. At 7 p.m. an Air Quality Alert was issued notifying the public that air quality had entered the "Maroon" level and was considered Hazardous (PM₁₀ 301-500 μm^3). The AQI remained at Very Unhealthy until rising to Unhealthy at 11 p.m. where it remained until the rest of the day. Niland (English Rd) air quality (**Fig. 5-25**) began May 21 in the Unhealthy category until finally rising to Unhealthy for Sensitive Groups at 5 p.m. At 9 p.m. air quality had improved enough to be classified at Moderate. Westmorland's AQI (**Fig. 5-26**) stood in the "Purple" or Very Unhealthy level from 1 a.m. to 2 p.m. At 1 a.m. an Air Quality Alert was issued notifying the public that air quality stood at Very Unhealthy. By 3 p.m. air quality had improved marginally and rose to Unhealthy. By 10 p.m. air quality had rose even further to the "Yellow" or Moderate level. See **Appendix A** for air quality alerts.

FIGURE 5-22
IMPERIAL VALLEY AIR QUALITY INDEX IN BRAWLEY
MAY 21, 2016

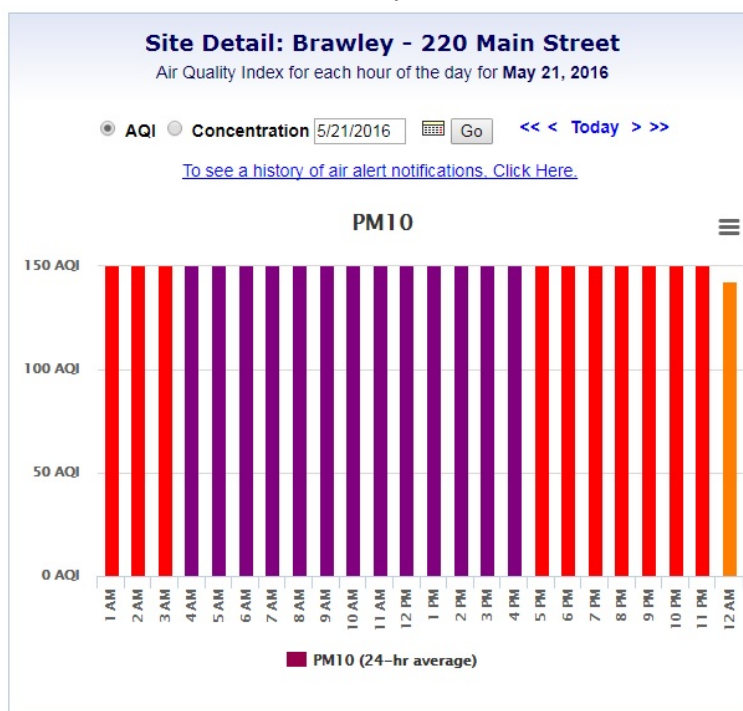


Fig 5-22: The reduced air quality in Brawley shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives.

FIGURE 5-23
IMPERIAL VALLEY AIR QUALITY INDEX IN CALEXICO
MAY 21, 2016
PM10

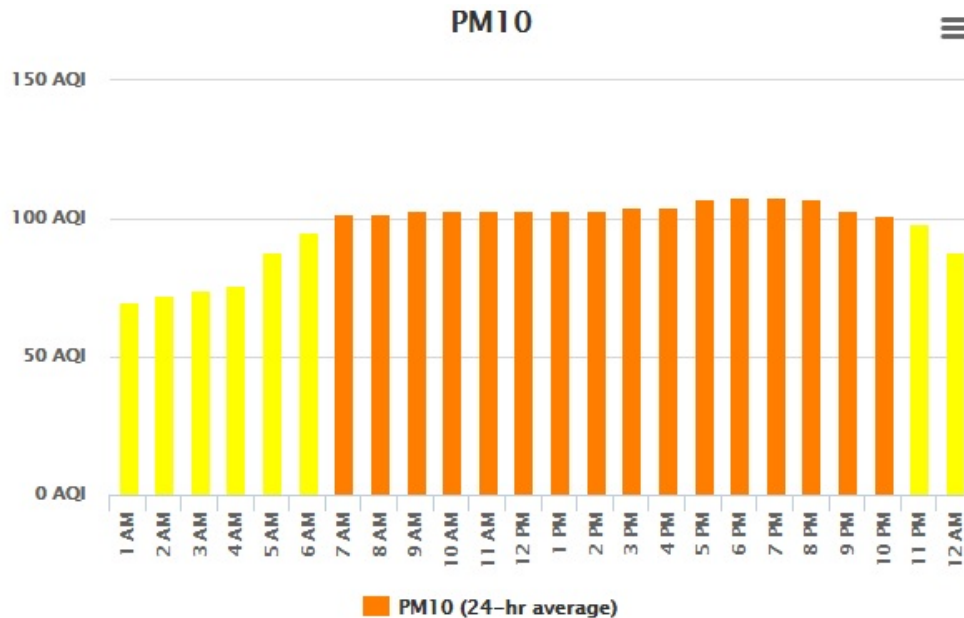


Fig 5-23: The reduced air quality in Calexico shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-24
IMPERIAL VALLEY AIR QUALITY INDEX IN EL CENTRO
MAY 21, 2016
PM10

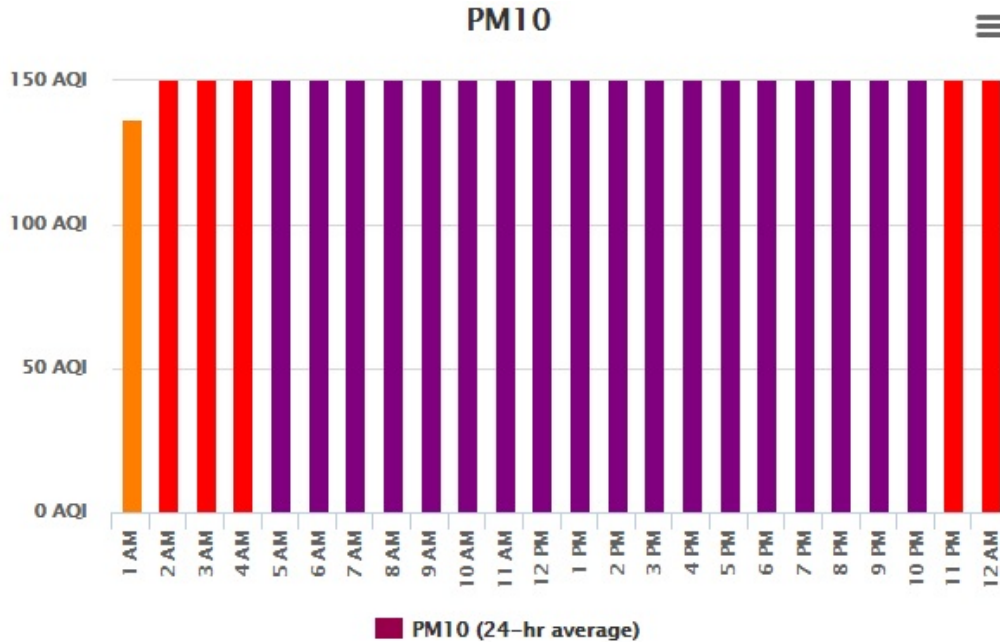


Fig 5-24: The reduced air quality in El Centro shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

FIGURE 5-25
IMPERIAL VALLEY AIR QUALITY INDEX IN NILAND
MAY 21, 2016

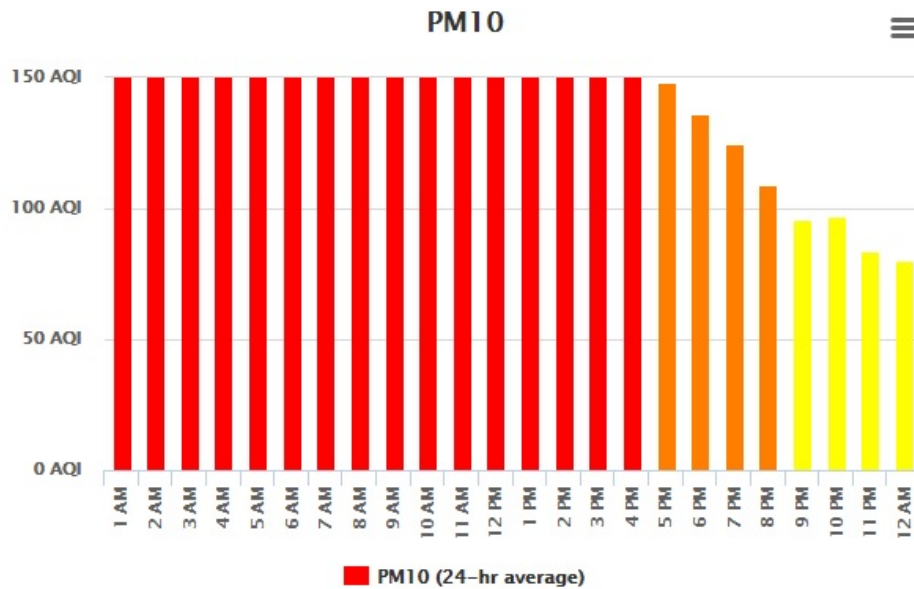


Fig 5-25: The reduced air quality in Niland (English Rd) shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives.

FIGURE 5-26
IMPERIAL VALLEY AIR QUALITY INDEX IN WESTMORLAND
MAY 21, 2016

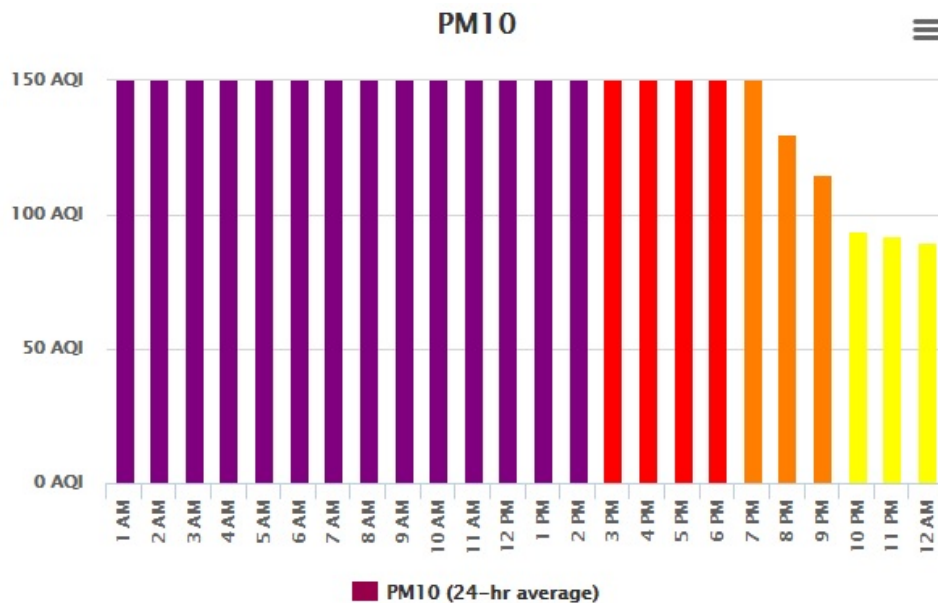


Fig 5-26: The reduced air quality in Westmorland shows that the fugitive dust entrained by high winds affected the air quality of the Imperial Valley. Source: ICAPCD archives

V.2 Summary

The preceding discussion, graphs, figures, and tables provide wind direction, speed and concentration data illustrating the spatial and temporal effects of the steep pressure gradient accompanying the low-pressure system that passed through the southern region of California. The information provides a clear causal relationship between the entrained windblown dust and the PM₁₀ exceedance measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors on May 20 and May 21, 2016. Furthermore, the advisories and air quality index illustrate the affect upon air quality within the region extending from the mountains and desert slopes of San Diego County, all of Imperial County and the southern portion of Riverside County. Large amounts of coarse particles (dust) and PM₁₀ were carried aloft by strong westerly winds into the lower atmosphere causing a change in the air quality conditions within Imperial County. The entrained dust originated from as far as the mountains and desert slope areas located within San Diego County and Imperial County (part of the Sonoran Desert). Combined, the information demonstrates that the elevated PM₁₀ concentrations measured on May 20 and May 21, 2016 coincided with high wind speeds and that gusty west winds were experienced over the southern portion of Riverside County, southeastern San Diego County, all of Imperial County, and parts of Arizona.

FIGURE 5-27
MAY 20 AND MAY 21, 2016 WIND EVENT TAKEAWAY POINTS

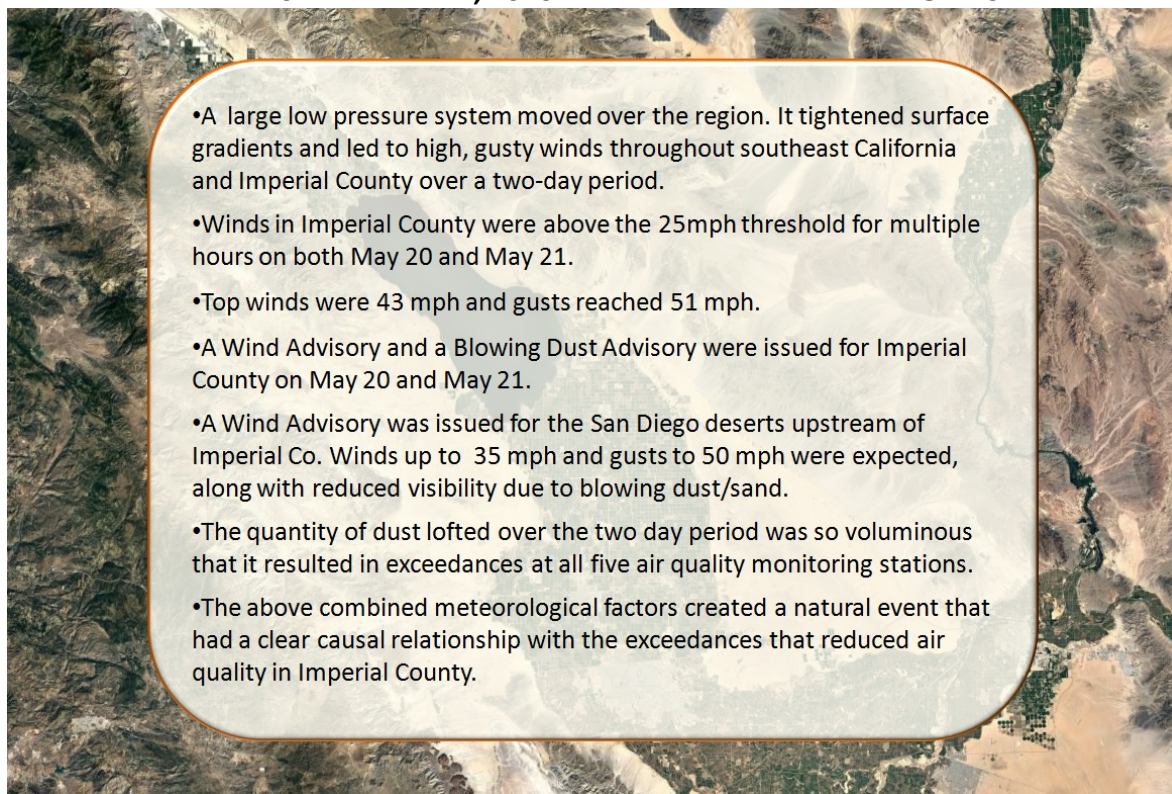


Fig 5-27: Illustrates the factors that qualify the May 20 and May 21, 2016 natural event which affected air quality as an Exceptional Event

VI Conclusions

The PM₁₀ exceedance that occurred on May 20, 2016 and May 21, 2016, satisfies the criteria of the EER, which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1 TECHNICAL ELEMENTS CHECKLIST		
EXCEPTIONAL EVENT DEMONSTRATION FOR HIGH WIND DUST EVENT (PM ₁₀)		DOCUMENT SECTION
1	A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s)	6-34; 92
2	A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation	60-90; 91
3	Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) of this section	35-51; 92
4	A demonstration that the event was both not reasonably controllable and not reasonably preventable	52-59; 91
5	A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event	60-90; 91

VI.1 Affects Air Quality

The preamble to the revised EER states that an event is considered to have affected air quality if it can be demonstrated that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Given the information presented in this demonstration, particularly Section V, we can reasonably conclude that there exists a clear causal relationship between the monitored exceedance and the May 20, 2016 and May 21, 2016 event which changed or affected air quality in Imperial County.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be “not reasonably controllable or preventable.” The revised preamble explains that the nRCP has two prongs, not reasonably preventable and not reasonably controllable. The nRCP is met for natural events where high wind events entrain dust from desert areas, whose sources are controlled by BACM, where human activity played little or no

direct causal role. This demonstration provides evidence that despite BACM in place within Imperial County, high winds overwhelmed all BACM controls where human activity played little to no direct causal role. The PM₁₀ exceedance measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the Sonoran Desert regions to the west of Imperial County. These facts provide strong evidence that the PM₁₀ exceedances at Brawley, Calexico, El Centro Niland, and Westmorland on May 20, 2016 and May 21, 2016, were not reasonably controllable or preventable.

VI.3 Natural Event

The revised preamble to the EER clarifies that a “Natural Event” (50.1(k) of 40 CFR Part 50) is an event and its resulting emissions, which may recur at the same location where anthropogenic sources that are reasonably controlled are considered not to play a direct role in causing emissions, thus meeting the criteria that human activity played little or no direct causal role. As discussed within this demonstration, the PM₁₀ exceedances that occurred at Brawley, Calexico, El Centro, Niland, and Westmorland on May 20, 2016 and May 21, 2016, were caused by the transport of fugitive dust into Imperial County by strong westerly winds associated with the passage of low pressure system that moved through the region. At the time of the event anthropogenic sources were reasonably controlled with BACM. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM₁₀ concentrations at Brawley, Westmorland, and Niland during different days, and the comparative analysis of different areas in Imperial and Riverside county monitors demonstrates a consistency of elevated gusty west winds and concentrations of PM₁₀ at the Brawley, Calexico, El Centro, Niland, and Westmorland monitoring stations on May 20, 2016 and May 21, 2016 (Section V). In addition, these time series plots and graphs demonstrate that the high PM₁₀ concentrations and the gusty west winds were an event that was widespread, regional and not preventable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty west winds. Days immediately before and after the high wind event PM₁₀ concentrations were well below the NAAQS. Overall, the demonstration provides evidence of the strong correlation between the natural event and the entrained fugitive emissions to the exceedances on May 20, 2016 and May 21, 2016.

VI.5 Historical Concentrations

The historical annual and seasonal 24-hr average PM₁₀ values measured at the Brawley, Calexico, El Centro, Niland, and Westmorland monitors were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

This section contains wind advisories issued by the National Weather Service and Imperial County on or around May 20, 2016 and May 21, 2016. In addition, this Appendix contains the air quality alert issued by Imperial County advising sensitive receptors of potentially unhealthy conditions in Imperial County resulting from the strong gusty winds. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM₁₀ concentrations in Imperial County.

Appendix B: Meteorological Data

This Appendix contains the time series plots, graphs, wind roses, etc. for selected monitors in Imperial and Riverside Counties. These plots, graphs and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM₁₀ Concentrations and Winds

This Appendix contains the graphs depicting the correlations between PM₁₀ Concentrations and elevated wind speeds for selected monitors in Imperial and Riverside Counties. These graphs demonstrate the region wide impact of the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule

This Appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. A total of seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.